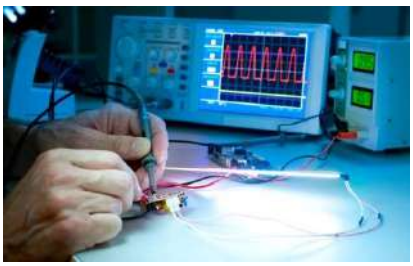
GOVERNMENT OF ANDHRA PRADESH

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING
Andhra Pradesh :: AMARAVATI

Globally Competitive

CURRICULUM (C-20)

For Polytechnic Diploma Courses in Andhra Pradesh



3 YEAR (REGULAR) DIPLOMA IN

ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM -2020
(C-20)

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DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

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CURRICULUM -2020
(C-20)

FOR DIPLOMA COURSES IN ANDHRA PRADESH

PREAMBLE

The proposed programme intends to develop a skilled technician to support the industries both nationally or globally. It also helps to kindle the spirit of entrepreneurship with necessary skills and theoretical inputs aligning with the National policy of 'Make in India'. The programme also provides for accomplishing higher education goals for those who wish to enrich their theoretical concepts further.

The State Board of Technical Education and Training, (SBTET) AP, has been offering Diploma programmes to meet the above said aspirations of the stake holders: industries, students, academia, parents and the society at large. As such, it has been the practice of SBTET, A.P., to keep the curriculum abreast with the advances in technology through systematic and scientific analysis of current curriculum and bring out an updated revised version at regular intervals. Accordingly the SBTET, AP under the aegis of the Department of Technical Education, Andhra Pradesh in it's 57th Board Meeting held on 05-02-2019 (vide item no: 18) resolved to update the Polytechnic Curriculum C-16 with the guidance of National Institute of Technical Teachers Training & Research (NITTTR), Extension Centre, Vijayawada (ECV), to be implemented with effect from the academic year '20-21.

Analysis of Curriculum C-16 (SWOT analysis) started in the month of June-2019. Feedback was collected from all stake holders: Students, Lecturers, Senior Lecturers, Head of Sections and Principals for all programmes for this purpose. A series of workshops with subject experts followed in the subsequent weeks and the draft curricula were prepared for every programme. Finally, an interactive session with representatives from industries, academia and subject experts was held on 04.01.2020 for thorough perusal and critique of draft curricula; and the suggestions received thus received from Industrialists and academia have been recorded , validated by another set of experienced subject teachers from the Department of Technical education for incorporation into the Curriculum C-20.

The design of new Curricula for the different diploma programmes has thus been finalised with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh, and duly reviewed by Expert Committee constituted of academicians and representatives from industries. Thus, the primary objective of the curriculum change is to produce employable technicians in the country by correlating the growing needs of the industries with relevant academic input.

The outcome based approach as given by NBA guidelines has been followed throughout the design of this curriculum is designed to meet the requirements of NBA Accreditation, too.

The revised New Curriculum i.e., Curriculum–2020 (C-20) is approved by BoG of SBTET for its implementation with effect from 2020-21.

Highlights of Curriculum C-20:

1. Duration of course for regular Diploma and for sandwich Diploma is 3 years and 3½ years respectively.
2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. 6 Months Industrial training has been introduced for 3 years Diploma Courses and 1 year Industrial Training is introduced for 3 ½ years Sandwich Diploma courses.
4. Updated subjects relevant to the industry are introduced in all the Diploma courses.
5. CISCO course content has been incorporated into the ECE and CME programmes for certification from CISCO in lieu of industrial training when students are unable to get Industrial Training placement in any industry.
6. The policy decisions taken at the State and 1Central level with regard to environmental science are implemented by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.
7. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the Industries, emphasis is given for learning and acquiring listening, speaking, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are continuing for all the branches.
8. CAD specific to the branch has been given emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
9. Upon reviewing the existing C-16 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In C-20 curriculum, more emphasis is given to the practical content in Laboratories and Workshops, thus strengthening the practical skills.
10. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based.
11. Curricula of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available in the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to confirm to the field requirements of industry.
12. An exclusive section for assessing Higher order Thinking skills (HOTS) has been introduced in summative evaluation.

Acknowledgements:

It is pertinent to acknowledge the support of the following in the making of Curriculum C-20.
A series of workshops in three phases were conducted by NITTTR, AP Extension Centre, Vijayawada involving faculty from Polytechnics, Premier Engineering Colleges & Industries to analyze the Previous C-16 Curriculum and to design C-20 Curriculum under the guidance of Dr C. R. Nagendra Rao, Professor & Head, NITTTR-ECV. The efforts & support extended by NITTTR to bring out final Curriculum C-20 by incorporating needs, aspiration & expectations of all stake holders is highly appreciated and gratefully acknowledged.

The Members of the working group are grateful to Sri M.M. Nayak, I.A.S., Special Commissioner of Technical Education & Chairman of SBTET, AP. and Sri. G. Anantha Ramu, I.A.S., Principal Secretary, Department of Skill Development and Training for their guidance and valuable inputs during process of revising, modifying and updating the Curriculum C-20.

The Members acknowledge with thanks the guidance & inspiration provided by Sri. V.S. Dutt, Secretary, SBTET, Andhra Pradesh and other officials of Directorate of Technical Education and the

State Board of Technical Education, Andhra Pradesh, experts from industry, academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

RULES AND REGULATIONS OF C-20 CURRICULUM

1 DURATION AND PATTERN OF THE COURSES

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of academic instruction.

All the Diploma courses are run on year wise pattern in the first year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in Bio-Medical course, the training will be in the seventh semester. Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.

2 PROCEDURE FOR ADMISSION INTO THE DIPLOMA COURSES:

Selection of candidates is governed by the Rules and Regulations laid down in this regard from time to time.

a) Candidates who wish to seek admission in any of the Diploma courses will have to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).

b) The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of applying for the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission.

c) Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.

d) For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.

i). D.HMCT ii).D. Pharmacy

3 MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be English.

4 PERMANENT IDENTIFICATION NUMBER (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., A Permanent Identification Number (PIN) will be allotted to each admitted candidate to maintain academic records.

5 NUMBER OF WORKING DAYS PER SEMESTER / YEAR:

a) The Academic year for all the Courses shall be in accordance with the Academic Calendar.

b) The Working days in a week shall be from Monday to Saturday

c) There shall be 7 periods of 50 minutes duration each on all working days.

d) The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to complete the syllabus.

6 ELIGIBILITY (ATTENDANCE TO APPEAR FOR THE END EXAMINATION)

a) A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.
b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.
c) A stipulated fee shall be payable towards condonation for shortage of attendance.
d) Candidates having less than 65% attendance shall be detained.
e) Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered in the next subsequent academic semester/year.
f) For INDUSTRIAL TRAINING:
   i) During Industrial Training the candidate shall put in a minimum of 90% attendance.

   ii) If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training at his own expenses.

7 READMISSION

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

a) (i) Within 15 days after commencement of class work in any semester (Except Industrial Training).
   (ii) For Industrial Training: before commencement of the Industrial training.
b) Within 30 days after commencement of class work in any year (including D. Pharmacy course or first year course in Engineering and Non Engineering Diploma streams).
   Otherwise such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.
   The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work.

8 SCHEME OF Evaluation

a) First Year

THEORY Courses: Each Course carries Maximum marks of 80 with examination of 3 hours duration, along with internal assessment for Maximum of 20 marks. (Sessional marks). However, there are no minimum marks prescribed for sessionals.
Laboratory Courses: There shall be 40 Marks for internal assessment i.e. sessional marks for each practical Course with an end examination of 3 hours duration carrying 60 marks. However, there are no minimum marks prescribed for sessionals.

b) III, IV, V, VI and VII Semesters:

THEORY Courses: End semester evaluation shall be of 3 hours duration and for a maximum of 80 marks.

Laboratory Courses: Each Course carry 60/30 marks of 3hours duration 40/20sessional marks.

9 INTERNAL ASSESSMENT SCHEME

a) **Theory Courses**: Internal assessment shall be conducted for awarding sessional marks on the dates specified. **Three unit tests shall be conducted for I year students and two Unit Tests for semesters.**

Internal Assessment shall be of 90 minutes duration and for a maximum of 40 marks. For each test

The average of marks of all the test, reduced to 20 shall be taken as final sessional in any case.

b) **Practical Courses**:

(i) **Drawing Courses:**

The award of sessional marks for internal Assessment shall be as given in the following table

Distribution of Marks for the Internal Assessment Marks			
First Year (Total:40 Marks)		**Semesters (Total:40 Marks)**	
Max:20 Marks	Max:20 Marks	Max:20 Marks	Max:20 Marks
From the Average of THREE Unit Tests.	From the Average of Assessment of Regular Class work Exercises.	From the Average of TWO Unit Tests.	From the Average of Assessment of Regular Class work Exercises.

All Drawing exercises are to be filed in **serial order** and secured for further scrutiny by a competent authority

(ii) Laboratory Courses:

Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40 marks in each practical Course.

Evaluation for Laboratory Courses, other than Drawing courses:

i. Instruction (teaching) in laboratory courses (except for the course on Drawing) here after shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in SBTET website.
ii. Internal assessment for Laboratory shall be done on the basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in AP, SBTET website.
iii. Question paper for End semester Evaluation shall also be task/s based and shall be prepared and distributed by SBTET as done in case of theory courses be prepared as per SBTET rules in vogue.

c) Internal assessment in Labs / workshops / Survey field work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Teacher.

d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of Section preferably choosing a qualified person from in the order of preference.

i) Nearby Industry
ii) Govt / Semi Govt organization like R & B, PWD, PR, Railways, BSNL,APSRTC,APSEB etc.,
iii) Govt / University Engg College.
iv) HoDs from Govt.Polytechnic

Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.

e) Question Paper for Practicals: Question paper should cover (the experiments / exercise prescribed to test various) skills like handling, manipulating, testing, trouble shooting, repair, assembling and dismantling etc., from more than one experiment / exercise

f) Records pertaining to internal assessment marks of both theory and practical Courses are to be maintained for official inspection.

g) **In case of Diploma programs *having* Industrial Training, Internal Assessment and**

Summative Evaluation, shall be done as illustrated in the following table:

Assessment no	**Upon completion of**	**By**	**Based on**	**Max Marks**
1	12 weeks	1.The faculty concerned (Guide) and 2. Training in charge (Mentor) of the industry	Learning outcomes as given in the scheme of assessment for Industrial Training	120
2	22 weeks			120
3.Final summative Evaluation	24 week	1.The faculty member concerned, 2.HoD concerned and 3.An external examiner	1.Demonstration of any one of the skills listed in learning outcomes	30
			2.Training Report	20
			3.Viva Voce	10
			TOTAL	**300**

10 MINIMUM PASS MARKS

THEORY EXAMINATION:

For passing a theory Course, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

PRACTICAL EXAMINATION:

For passing a practical Course, a candidate has to secure a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical end examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand Courses of D.C.C.P course.

INDUSTRIAL TRAINING:

a) Monitoring

Similar to project work each teacher may be assigned a batch of 10-15 students irrespective of the placement of the students to facilitate effective monitoring of students learning during industrial training.

b) Assessment

The Industrial training shall carry 300 marks and pass marks is 50% in assessments at industry (first and second assessment) and final summative assessment at institution level put together i.e. 150 marks out of 300 marks. And also student has to secure 50% marks in final summative assessment at institution level.

INDUSTRIAL ASSESSMENT:

Pass marks is 50% in assessment at Industry (I and II assessments put together) and also 50% in final summative assessment at institution level

11. PROVISION FOR IMPROVEMENT

Improvement is allowed only after he / she has completed all the Courses from First Year to Final semester of the Diploma.

a) Improvement is allowed in any 4 (Four) Courses of the Diploma.
b) The student can avail of this improvement chance **ONLY ONCE**, that too within the succeeding two examinations after the completion of Diploma. However, the duration including Improvement examination shall not exceed **FIVE** years from the year of first admission.
c) No improvement is allowed in Practical / Lab Courses or Project work or Industrial Training assessment. However, improvement in drawing Course(s) is allowed.
d) If improvement is not achieved, the marks obtained in previous Examinations hold good.
e) Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.
f) Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
g) All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued, else the submitted originals will be returned.

12. RULES OF PROMOTION FROM 1ST YEAR TO 3,rd, 4,th 5th ,6th and 7th SEMESTERS:

A)For Diploma Courses of 3 Years duration

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training, AP from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

a) Puts the required percentage of attendance in the 4th semester
b) Should not have failed in more than four Courses in 1st year

For IVC & ITI Lateral Entry Students:

a) A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester
b) A candidate is eligible to appear for the 4th semester examination if he/she clears at least two Courses in third semester.

iv) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she

a) Puts the required percentage of attendance in the 5th semester
b) Should get eligibility to appear for 4th Semester examination.

The first backlog exam in 5th semester will be conducted only in instant/supplementary diploma examination.

For IVC& ITI Lateral Entry students:

a) Puts the required percentage of attendance in the 5th semester

v) A candidate shall be sent to Industrial training provided he/she puts in the required percentage of attendance in the 4th semester and pay the examination fee/ promotion fee as prescribed by SBTET.

A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-voce)

a) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training

For IVC & ITI Lateral Entry students:

a) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training.
b) should get eligibility to appear for 5th Semester Examination.

B) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT):

i. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester exam if he/she

a). Puts the required percentage of attendance in the 4th semester

b). Should not have failed in more than Four backlog Courses of 1st year.

For IVC & ITI Lateral Entry students:

a) Puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester industrial training provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

v. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of attendance, which in this case ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.

vi. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 7th semester.

vii. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.

A candidate is eligible to appear for 7th semester examination if he/she

a) Puts in the required percentage of attendance in the 7th semester
b) Should get eligibility to appear for 4th semester Examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in the 7th semester
b) Should not have failed more than four backlog Courses of 3rd Semester

C) For Diploma Courses of 3 ½ Years duration (BM):

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

a) Puts in the required percentage of attendance in the 4th semester
b) Should not have failed in more than Four backlog Courses of 1st year

For IVC & ITI Lateral Entry Students:

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the

promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester exam if he/she

a) Puts in the required percentage of attendance in the 5 th semester.
b) Should get eligibility to appear for 4th Semester examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in the 5th semester.
b) Should not have failed in more than Four backlog Courses of 3rd Semester.

v. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.

A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

A candidate is eligible to appear for 6th semester examination

a) Puts in the required percentage of attendance in 6th semester and
b) should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in 6th semester.
b) Should get eligibility to appear for 5th Semester Examination.

vi. A candidate shall be promoted to 7th semester provided he/she puts in the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment (Seminar/Viva-voce) if he/she

a) Puts in the required percentage of attendance, ie., 90% in 7th semester Industrial Training
b) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance, ie., 90% in 7th semester Industrial Training.
b) Should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. However, the record of internal Assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

OTHER DETAILS

a) In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.
b) The First spell of Industrial training shall commence 10 days after the completion of the last theory examination of 4th Semester.
c) The Second spell of Industrial training shall commence within 10 days after the completion of first spell of Industrial training.

13. STUDENTS PERFORMANCE EVALUATION

Successful candidates shall be awarded the Diploma under the following divisions of pass.

a) First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.
b) First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.
c) Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.
    i. The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.
    ii. In respect IVC & ITI Lateral Entry candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters of study shall be taken into consideration for determining the overall percentage of marks secured by the candidates for award of class/division.
d) Second Class shall be awarded to all students, who fail to complete the Diploma in the regular 3 years/ 3 ½ years and four subsequent examinations, from the year of first admission.

14. EXAMINATION FEE SCHEDULE:

The examination fee should be as per the notification issued by State Board of Technical Education and Training, AP from time to time.

15. STRUCTURE OF EXAMINATION QUESTION PAPER:

I. Formative assessment (Internal examination)

a) For theory Courses:

Three unit tests for first year and two unit tests for semesters shall be conducted with a duration of 90 minutes for each test for maximum marks of 40. It consists of part A and Part B.

Part A contains five questions and carries 16 marks. Among these five questions first question consists of four objective items like one word or phrase answer/filling-in the blanks/true or false etc with one mark for each question. The other four questions are short answer questions and carry three marks each.

Part B carries 24 marks and consists of three questions with internal choice ie., Either/Or type , and each question carries 8 marks.

The sum of marks of 3 tests for I year and 2 tests for semesters shall be reduced to 20 marks in each Course for arriving at final sessional marks.

b) For drawing Courses:

For I year:

Three unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted for first year. It consists of part A and Part B.

Part A consists four questions for maximum marks of 16 and each question carries four marks (4×4 marks=16 marks).

Part B carries maximum marks of 24 and consists of five questions while the student shall answer any three questions out of these five questions. Each question in this part carries a maximum marks of 8, (3×8 marks=24 marks).

The sum of marks obtained in 3 unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise.

For semester: Two unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted. The sum of marks obtained in 2 unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise

c) For Laboratory /workshop: 50% of total marks for the Course shall be awarded based on continuous assessment of the student in laboratory/workshop classes and the remaining 50% shall be based on the sum of the marks obtained by the students in two tests.

II. Summative assessment (End examination)

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular Course be considered. End Examination paper is of 3 hours duration.

a) **Each theory paper consists of Section 'A', 'B' and 'C'**.

Section 'A' with Max marks of 30, contains 10 short answer questions. All questions are to be answered and each carries 3 marks, i.e., 10 x 3 = 30.

Section 'B' with Max marks of 40 contains 5 essay type questions including Numerical questions (without any divisions in the question), with internal choice(Either/or type), each carrying 8 marks, i.e., Max. Marks: 5 x 8 = 40.

Section 'C' with Max marks of 10 contains single essay type, Higher order Thinking skills question (HoTs)including Numerical questions, without choice (without any divisions in the question),

Thus the total marks for theory examination shall be: 80.

b) **For Engineering Drawing Course (107) consist of section 'A' and section 'B'**.

Section 'A' with max marks of 20, contains four (4) questions. All questions in section 'A' are to be answered to the scale and each carries 5 marks, ie. 4 x 5=20.

Section 'B' with max marks of 40, contains six (6) questions. The student shall answer any four (4) questions out of the above six questions and each question carries 10 Marks, ie. 4 x 10 = 40.

c) **Practical Examinations**

For Workshop practice and Laboratory Examinations, Each student has to pick up a question paper distributed by Lottery System.

Max. Marks for an experiment / exercise	:	50
Max. Marks for VIVA-VOCE	:	10
Total Max. Marks	:	60

In case of practical examinations with 50 marks, the marks shall be distributed as

Max. Marks for an experiment / exercise	:	25
Max. Marks for VIVA-VOCE	:	05
Total Max. Marks	:	30

In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

d) **Note: Evaluation for Laboratory Courses, other than Drawing courses**:

I. Instruction (teaching) in laboratory courses (except for the course on Drawing) hereafter shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP and posted in its website.

II. Internal assessment for Laboratory shall be done on basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP and posted in its website.

III. Question paper for End semester Evaluation shall be prepared as per SBTET rules in vogue.

16. ISSUE OF MEMORONDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo from time to time.

17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA Programmes:

Maximum period for completion of the diploma courses is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

18. ELIGIBILITY FOR AWARD OF DIPLOMA

A candidate is eligible for award of Diploma Certificate if he / she fulfil the following academic regulations.

i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.

ii. He / she have completed all the Courses.
Students who fail to fulfil all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

For IVC & ITI Lateral Entry students:

i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 academic years.
ii. He / she has completed all the Courses.
Students who fail to fulfill all the academic requirements for the award of the Diploma within 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

I. A candidate desirous of applying for Photo copy of valued answer script/s should apply within prescribed date from the date of the declaration of the result.
II. Photo copies of valued answer scripts will be issued to all theory Courses and Drawing Course(s).
III. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.
IV. No application can be entertained from third parties.

B) FOR RE-COUNTING(RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

i. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.
ii. Re-verification of valued answer script shall be done for all theory Courses' and Drawing Course(s).
iii. The Re-verification committee constituted by the Secretary, SBTETAP with Course experts shall re-verify the answer scripts.

I. **RE-COUNTING**

The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

II. RE-VERIFICATION

(i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.
(ii) Initially single member shall carry out the re-verification.
(iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level ie., for 2-Tier evaluation.

(iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.

(v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:

a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.

b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.

c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.

(vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.

(viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

Note: No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

20. MAL PRACTICE CASES:

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

21. DISCREPANCIES/ PLEAS:

Any Discrepancy /Pleas regarding results etc., shall be represented to the SBTETAP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

22. ISSUE OF DUPLICATE DIPLOMA

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed before a First Class Magistrate (Judicial) and non-traceablecertificate from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training, A.P.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET AP from time to time.

23. ISSUE OF MIGRATION CERTIFICATE AND TRANSCRIPTS:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

24. SPECIFIC CHANGES INCORPORATED IN PRESENT CURRICULUM C-20
ELECTRICAL & ELECTRONICS ENGINEERING BRANCH:

(a). Programming in C is introduced as Theory and Laboratory Course in 3rd Semester As EE-306 and EE-309 (A) respectively.

(b). Electrical CAD laboratory is introduced as EE-309(B) laboratory Course in3rd Semester.

(C). Basic Concepts of SCADA have been introduced in 5th semester EE-504 course.

(d). MAT LAB Course have been introduced as Practical Course in 5th semester as EE-509(B).

(e). Field Practice in Electrical Engineering Course is introduced in 4th semester as practical Course .

(f). Basic Concepts of operation of Micro Grid & SMART grid operations are incorporated in Power System – III course.

NOTE: REQUIRED SERVICES OF FACULTY FROM OTHER DISCIPLINES:

1. A faculty of Electronics & Communication Engineering shall invariably handle the following courses for the best benefit of the students.

I. EE-405 – Electronics Engineering
II. EE-410 – Electronics Engineering Laboratory
III. EE-505 – Digital Electronics & Micro Controllers
IV. EE-510 – Digital Electronics & Micro Controllers Laboratory

2. A faculty of Mechanical Engineering shall invariably handle the following course for the best benefit of the students.

I. EE-406 – General Mechanical Engineering

3. A faculty of Computer Engineering shall invariably handle the following course for the best benefit of the students.

I. EE-306 – Programming in C
II. EE-309 A – Programming in C Laboratory

4.The faculty of EEE to be trained in the fileds of newly added topics such as SCADA, CAD, PLC and MAT LAB etc., in order to enable them to perform effectively.

25. GENERAL

i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.
ii. All legal matters pertaining to the State Board of Technical Education and Training, AP are within the jurisdiction of Vijayawada.
iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P is final.

C-20 Curriculum for DEEE
With Industrial training (In-house) in Semester VI

VISION

To develop Electrical & Electronics Engineering professionals competent to face the global challenges in a Edifying environment conducive to learn technical knowledge, skills blended with ethics and values, to Coordinate and serve to the society for betterment and comfortable living.

MISSION

M1	To provide a competitive learning environment, through a need based curriculum designed in collaboration with industry, conducive for high quality education emphasising on transfer of knowledge and skill development essential for the profession and the society as well.
M2	To nurture higher order leadership qualities and ethics and values in students to enable them to be leaders in their chosen professions while maintaining the highest level of ethics.
M3	To encourage the spirit of inquisition to promote innovation and entrepreneurship strengthened with life skills to sustain the stress.
M4	To foster effective interactions and networking with all the stake holders so as to work towards the growth and sustainability of the society and environment.

Programme Educational Objectives (PEOs)

On completion of the Diploma Electrical & Electronics Engineering programme, the students should have acquired the following characteristics

PEO1	An ability to apply knowledge of mathematics, Science , engineering and management principles in solving problems in the field of Electrical and Electronics Engineering.
PEO2	To be life-long learners with sprit of enquiry and zeal to acquire new knowledge and skills so as to remain contemporary and posses required professional skills.
PEO3	To enhance entrepreneurial, communication and other soft skills, which will enable them to work globally as leaders, team members and contribute to nation building for the betterment of the society.
PEO4	To make them strongly committed to the highest levels of professional ethics and focus on ensuring quality, adherence to public policy and law, safety, reliability and environmental sustainability in all their professional activities

PROGRAMME OUTCOMES(POs)

1. **Basic and discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis**: Identify and analyse well-defined engineering problems using standard methods
3. **Design/Development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs
4. **Engineering tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

6. **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well defined engineering activities.
7. **Life-Long learning**: Ability to analyse individual needs and engaging updating in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. An ability to understand the basic concepts of Electrical & Electronics Engineering and to apply them to various areas like Wiring Installations, Lighting Schemes , Static & Rotating machinery, drawing layouts , Power System (Generation, Transmission, Distribution& utilisation), Digital electronics, power control devices, Computer programming ,managerial skills and the use SMART technologies .

2. An ability to Repair, develop and trouble shooting of Various Electrical & Electronics equipment's by using suitable tools and techniques, to design Customized applications in Electrical & Electronics Engineering at economic and efficient considerations, to develop software & hardware solutions.

3. Wisdom of social and environmental awareness along with ethical responsibility to have a successful career and to sustain passion and zeal in the field of Electrical & Electronics Engineering for real-world applications in the field of Electronics using optimal resources as an Entrepreneur.

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS (FIRST YEAR)

Subject Code	Name of the Subject	Instruction period /week		Total Period /year	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
EE-101	English	3	-	90	3	20	80	100
EE-102	Engineering Mathematics - I	5	-	150	3	20	80	100
EE-103	Engineering Physics	4	-	120	3	20	80	100
EE-104	Engineering chemistry & Environmental studies	4	-	120	3	20	80	100
EE-105	Electrical Engineering Materials	3	-	90	3	20	80	100
EE-106	Basic Electrical Engineering	5	-	150	3	20	80	100
PRACTICAL								
EE-107	Engineering Drawing	-	6	180	3	40	60	100
EE-108	Electrical Workshop & Wiring Practice	-	6	180	3	40	60	100
EE-109	109-A Physics Laboratory Practice 109-B Chemistry Laboratory Practice	-	**3** 3	**90** 90	1½ 1½	20 20	30 30	50 50
EE-110	Comp. Fundamentals Laboratory	-	3	90	3	40	60	100
	TOTAL	**24**	**18**	**1260**		**280**	**720**	**1000**

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS

III SEMESTER

Subject Code	Name of the Subject	Instruction period / week		Total Period /Sem	Scheme of Examination			
		Theory	Practical/Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
EE- 301	Engineering Mathematics - II	4	-	60	3	20	80	100
EE -302	Electrical Machines- I (DC Machines)	4	-	60	3	20	80	100
EE -303	Power System –I (Generation)	4	-	60	3	20	80	100
EE-304	Electrical & Electronic Measuring Instruments	4	-	60	3	20	80	100
EE-305	Electrical circuits	4	-	60	3	20	80	100
EE-306	PROGRAMMING IN ''C''	4	_	60	3	20	80	100
PRACTICAL								
EE-307	Electrical Engineering Drawing – I	-	6	90	3	40	60	100
EE-308	Electrical Machines – I Laboratory	-	3	45	3	40	60	100
EE-309	(a) Programming in CLaboratory (b) Electrical CADLaboratory	-	3 3	45 45	$1_{1/2}$ $1_{1/2}$	20 20	30 30	50 50
EE-310	Electrical Circuits & Measuring Instruments Laboratory	-	3	45	3	40	60	100
	TOTAL	**24**	**18**	**630**		**280**	**720**	**1000**

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical/Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
EE - 401	Engineering Mathematics- III	3	-	45	3	20	80	100
EE - 402	Electrical Machines- II (Transformer s& Alternators)	5	-	75	3	20	80	100
EE - 403	Power Systems – II (Transmission &Distribution)	4	-	60	3	20	80	100
EE - 404	Electrical Installation and Estimation	4	-	60	3	20	80	100
EE-405	Electronics Engineering	4	-	60	3	20	80	100
EE -406	GENERAL MECHANICAL ENGINEERING	4	_	60	3	20	80	100
PRACTICAL								
EE -407	Electrical EngineeringDrawing -II	-	6	90	3	40	60	100
EE - 408	Communicati on Skills Laboratory	-	3	45	3	40	60	100
EE - 409	(A) Electrical Machines – II Laboratory (B) Field Practice in Electrical Engineering	- -	3 3	45 45	$1_{1/2}$ $1_{1/2}$	20 20	30 30	50 50
EE - 410	Electronics Engineering Laboratory		3	45	3	40	60	100
TOTAL		**24**	**18**	**630**	**30**	**280**	**720**	**1000**

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS

V Semester

Subject Code	Name of the Subject	Instructionperiod / week		Total Period/Sem	Scheme of Examination			
		Theory	Practical/Tutoral		Duration (hours)	Sessional Marks	End Exam Marks	TotalMarks
THEORY								
EE- 501	Industrial Management &Smart Technologies	4	-	60	3	20	80	100
EE- 502	Electrical Machines-III (A.C Motors and Drives)	4	-	60	3	20	80	100
EE- 503	Power Systems – III (Switch Gear & Protection)	4	-	60	3	20	80	100
EE- 504	Power Electronics, PLC & SCADA	4	-	60	3	20	80	100
EE- 505	Digital Electronics & Micro Controllers	4	-	60	3	20	80	100
EE- 506	Electrical Utilization and Traction	4	-	60	3	20	80	100
PRACTICAL								
EE-507	Electrical Machines – III Laboratory	-	3	45	3	40	60	100
EE-508	Life skills	-	3	45	3	40	60	100
EE-509	(a) PLC &SCADA (b) Power Electronics & MAT Lab Practice	- -	3 3	45 45	1 ½ 1 1/2	20 20	30 30	50 50
EE-510	Digital Electronics & Micro Controllers Lab	-	3	45	3	40	60	100
EE-511	Project Work	-	3	45	3	40	60	100
	TOTAL	**24**	**18**	**630**		**320**	**780**	**1100**

DIPLOMA IN ELECTRIAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI SEMESTER
INDUSTRIAL TRAINING

Sl. No.	Course Title	Duration	Scheme of evaluation			Remarks
			Item	Nature	Max. Marks	
1	Industrial Training	6 Months	1.First Assessment at training place/ Industry (After 12 Weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	120	Pass marks is 50% in assessment at training place/industry (first and second assessment put together)
			2.Second Assessment at training place/Industry (After 20 weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	120	
			Final Summative assessment at institution level after completion of training.	Training Report	20	Pass marks is 50% in final summative assessment
				Demonstration of any one of the skills listed in learning outcomes	30	
				Viva Voce	10	
TOTAL MARKS					300	

FIRST YEAR

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS (FIRST YEAR)

Subject Code	Name of the Subject	Instruction period /week		Total Period /year	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
EE-101	English	3	-	90	3	20	80	100
EE-102	Engineering Mathematics - I	5	-	150	3	20	80	100
EE-103	Engineering Physics	4	-	120	3	20	80	100
EE-104	Engineering chemistry & Environmental studies	4	-	120	3	20	80	100
EE-105	Electrical Engineering Materials	3	-	90	3	20	80	100
EE-106	Basic Electrical Engineering	5	-	150	3	20	80	100
PRACTICAL								
EE-107	Engineering Drawing	-	6	180	3	40	60	100
EE-108	Electrical Workshop & Wiring Practice	-	6	180	3	40	60	100
EE-109	109-A Physics Laboratory Practice 109-B Chemistry Laboratory Practice	-	**3** 3	**90** 90	1½ 1½	20 20	30 30	50 50
EE-110	Comp. Fundamentals Laboratory	-	3	90	3	40	60	100
	TOTAL	**24**	**18**	**1260**		**280**	**720**	**1000**

English

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
EE-101	English	3	90	20	80

S. No.	Unit Title	No of Periods	COs Mapped
1	English for Employability	8	CO1, CO2, CO3, CO4
2	Living in Harmony	8	CO1, CO2, CO3, CO4
3	Connect with Care	8	CO1, CO2, CO3, CO4
4	Humour for Happiness	8	CO1, CO2, CO3, CO4
5	Never Ever Give Up!	8	CO1, CO2, CO3, CO4
6	Preserve or Perish	9	CO1, CO2, CO3, CO4
7	The Rainbow of Diversity	8	CO1, CO2, CO3, CO4
8	New Challenges- Newer Ideas	8	CO1, CO2, CO3, CO4
9	The End Point First!	8	CO1, CO2, CO3, CO4
10	The Equal Halves	8	CO1, CO2, CO3, CO4
11	Dealing with Disaster	9	CO1, CO2, CO3, CO4
Total Periods		**90**	

Course Objectives	To improve the skills of English Language use by enriching vocabulary and learning accurate structures for effective communication.
	To comprehend themes for value based living in professional and personal settings.

CO No.	Course Outcomes
CO1	Applies perceptions of themes related to societal responsibility of adolescents towards their surroundings.
CO2	Demonstrates knowledge of form and function of 'grammar items' and use them in both academic and everyday situations.
CO3	Demonstrates effective English communication skills with competence in listening, speaking, reading and writing in academic, professional and everyday contexts.
CO4	Displays positivity and values of harmonious living in personal and professional spheres as reflected through communication.

CO-PO Matrix

Course Code EE-101	Course Title: English Number of Course Outcomes: 4				No. of Periods: 90
POs	**Mapped with CO No.**	**CO Periods Addressing PO in Column 1**		**Level of Mapping (1,2,3)**	**Remarks**
		Number	**Percentage**		
PO1		Not directly Applicable for English course, however activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.			
PO2					
PO3					
PO4					
PO5	CO1, CO2, CO3, CO4	20	22		>50%: Level 3 21-50%: Level 2 Up to 20%: Level 1
PO6	CO1, CO2, CO3, CO4	52	58		
PO7	CO1, CO2, CO3, CO4	18	20		

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO 1					✓	✓	✓
CO 2					✓	✓	✓
CO3					✓	✓	✓
CO 4					✓	✓	✓

NOTE: CO-PO groups shall be fulfilled through activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

Blue Print of Question Paper:

S. No.	Name of the Unit	Periods Allocated	Weightage Allocated	Marks Wise Distribution of Weightage				Question Wise Distribution of Weightage				CO's Mapped
				R	U	Ap	An	R	U	Ap	An	
1	English for Employability	8	17	3	8*			1	1*	1*		CO1, CO2, CO3, CO4
2	Living in Harmony	8		3				1				CO1, CO2, CO3, CO4
3	Connect with Care	8				3						CO1, CO2, CO3, CO4
4	Humour for Happiness	8	14		3	8*			1	1*		CO1, CO2, CO3, CO4
5	Never Ever Give Up!	8			3				1			CO1, CO2, CO3, CO4
6	Preserve or Perish	9	14		8*	3			1*	1		CO1, CO2, CO3, CO4
7	The Rainbow of Diversity	8				3	10*			1		CO1, CO2, CO3, CO4
8	New Challenges - Newer Ideas	8	35		8*	8*+ 3+3+ 3			1*	4	1*	CO1, CO2, CO3, CO4
9	The End Point First!	8										CO1, CO2, CO3, CO4
10	The Equal Halves	8										CO1, CO2, CO3, CO4
11	Dealing with Disasters	9										CO1, CO2, CO3, CO4
TOTAL		**90**	**80**	**6**	**30**	**34**	**10**	**2**	**5**	**8**	**1**	

PART-A: 10 Questions 3 marks each =30 Marks
PART-B: 5 Questions 8 marks each =40 Marks
Part-C: 1 Question 10 marks =10 Marks
(Higher Order Question)

All Questions are compulsory : 60 minutes
Internal choice : 90 minutes

No choice, one compulsory question : 30 minutes

NOTE: * indicates questions can be given from any of the corresponding lessons in the blue print.

Question Paper Pattern for Unit Tests

Part A: 16 marks: 4 questions with 1 mark each (FIB, True/false, one word/phrase, etc.)
4 questions with 3 marks each (short answer/ descriptive/ applicative questions)
Part B: 24 marks: 3 questions 8 marks each with internal choice

Learning Outcomes

1. English for Employability

1.1. Explain the need for improving communication in English for employability
1.2. Use adjectives and articles effectively while speaking and in writing
1.3. Write simple sentences

2. Living in Harmony

2.1. Develop positive self-esteem for harmonious relationships
2.2. Use affixation to form new words
2.3. Use prepositions and use a few phrasal verbs contextually

3. Connect with Care

3.1. Use social media with discretion
3.2. Speak about abilities and possibilities
3.3. Make requests and express obligations
3.4. Use modal verbs and main verbs in appropriate form
3.5. Write short dialogues for everyday situations

4. Humour for Happiness

4.1. Explain the importance of humour for a healthy living
4.2. Improve vocabulary related to the theme
4.3. Display reading and speaking skills
4.4. Frame sentences with proper Subject – Verb agreement
4.5. Explain the features of a good paragraph and learn how to gather ideas as a preliminary step for writing a good paragraph.

5. Never Ever Give Up!

5.1. Practice to deal with failures in life.
5.2. Use the present tense form for various every day communicative functions such as speaking andwriting about routines, professions, scientific descriptions and sports commentary.
5.3 Write paragraphs with coherence and other necessary skills.

6. Preserve or Perish

6.1. Describe the ecological challenges that we face today and act to save the environment.
6.2. Narrate / Report past events.
6.3. Develop vocabulary related to environment.
6.4. Write e-mails.

7. The Rainbow of Diversity

7.1. Illustrate and value other cultures for a happy living in multi-cultural workspace
7.2. use different types of sentences
7.3. Ask for or give directions, information, instructions
7.4. Use language to express emotions in various situations
7.5. Write letters in various real life situations

8. New Challenges – Newer Ideas

8.1. Explain the functional difference between Active Voice and Passive Voice
8.2. Use Passive Voice to speak and write in various contexts
8.3. List the major parts and salient features of an essay
8.4. Explain latest innovations and get motivated

9. The End Point First!

9.1. Illustrate the importance of setting a goal in life
9.2. Report about what others have said both in speaking and writing
9.3. Write an essay following the structure in a cohesive and comprehensive manner
9.4. Apply the words related to Goal Setting in conversations and in life

10. The Equal Halves

10.1. Value the other genders and develop a gender-balanced view towards life
10.2. Identify the use of different conjunctions in synthesising sentences
10.3. Write various types of sentences to compare and contrast the ideas
10.4. Apply the knowledge of sentence synthesis in revising and rewriting short essays
10.5. Develop discourses in speech and writing

11. Dealing with Disasters

11.1. Speak and write about different kinds of disasters and the concept of disaster management
11.2. Generate vocabulary relevant to disaster management and use it in sentences
11.3. Analyze an error in a sentence and correct it
11.4. write different kinds of reports

Textbook: INTERACT (A Textbook for I Year English) - Published by SBTET, AP

Reference Books:

Martin Hewings	:	Advanced Grammar in Use, Cambridge University Press
Murphy, Raymond	:	English Grammar in Use,Cambridge University Press
Sidney Greenbaum	:	Oxford English Grammar, Oxford University Press
Wren and Martin (Revised byN.D.V. Prasad Rao)	:	English Grammar and Composition, Blackie ELT Books, S. Chand and Co.
Sarah Freeman	:	Strengthen Your Writing, Macmillan

STATE BOARD OF TECHNICAL EDUCATION –A.P

C20- EE-101-ENGLISH

UNIT TEST-1

Time: 90 minutes **Max. Marks: 40**

PART-A **4X4= 16 marks**

Instructions: Answer all the questions. Each question carries FOUR Marks.

1 Rewrite / Fill in the blank as directed. Each question carries ½ Mark. **(CO2)**

a) Write the antonym of 'cruel'
b) Write the synonym of 'love'
c) Give prefix to 'adventure'.
d) Give suffix to ' liberate'
e) It is _____ universal truth. (Fill in with suitable article)
f) The boy is fond ____ ice-cream. (Fill in the blank with proper preposition)
g) He ____not like sweets. (Fill in the blank with correct primary auxiliary verb.)
h) We _____ respect our national flag. (Fill in with a proper modal verb)

2. Rewrite the sentences as directed. Each question carries One mark. 4X1=4 Marks **(CO2)**

a) No other metal is so useful as iron. (Change into superlative degree)
b) Very few students are so clever as Ramesh. (Change into comparative degree)
c) Guess the contextual meaning of the italicized word in the following sentence.
"The CBI officer has *interrogated* the bank employees in connection with the scam."
d) only sings plays Prasanth not also well but cricket. (Rearrange the jumbled words)

3. Fill in the blanks with proper form of the verb given in brackets. 4X1 = 4 marks **(CO2)**
The IPSGM _____(hold) in our college last month. Nearly all the colleges in our zone _____(participate) in the event. The prizes _____ (distribute) by the district collector. Next year, Government Polytechnic, Vijayawada _____ (conduct) the games meet.

4. Rewrite the following sentences after making necessary corrections: 4X 1= 4 Marks **(CO3)**

a) The police has arrested the culprit.
b) Three hundred miles are a long distance.
c) The Principal along with the Heads of Sections have visited the laboratories.
d) Either he or I is to blame.

PART-B **3X8=24 Marks**

Instructions: Answer all the questions and each question carries EIGHT marks.

5. Write a dialogue of at least five turns between a shopkeeper and customer about buying a mobile phone. **(CO3)**
6. Make an analysis and write a paragraph in around 100 words about your strengths and weaknesses in learning and using English and also the measures to improve it. **(CO3)**

5. Write a paragraph in about 100 words on how to overcome low esteem and negativity. **(CO3, CO4)**

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STATE BOARD OF TECHNICAL EDUCATION –A.P
C20-EE-101-ENGLISH
UNIT TEST-II

Time: 90 minutes **Max. Marks: 40**

PART-A **4X4= 16 Marks**

Instructions: Answer all the questions. Each question carries FOUR marks.

1. Match the words in column A with their corresponding meanings in column B **(CO2)**

Column A	**Column B**
a) Deserve	i) continuous
b) hidden	ii) protect
c) Preserve	iii) worthy
d) Incessant	iv) praise
	v) unseen
	vi) affection

2. Rewrite as directed: **(CO3)**
   a) You ask your Mom to give you another chocolate. (Change into a request)
   b) The baby fell down and got injured. (Change into an exclamatory sentence)
   c) The match was very interesting. (Frame a question using 'how')
   d) Hemanth submitted his project report last week. (Frame Yes-No question)

3. Fill in the blanks with appropriate forms of verbs given in brackets: **(CO2)**
   a) The Sun _____ (set) in the west.
   b) Balu _____ (sing) for over fifty years in the films.
   c) We _____ (see) a camel on the road yesterday.
   d) They _____(enter) the stadium before the gates were closed

4. Change the voice of the following: **(CO2)**
   a) Marconi invented the radio.
   b) Sravanthi has been offered a job.
   c) Pragathi can type the letter.
   d) The Chief Guest will be received by the Final year students.

PART-B **3X8=24 Marks**

Answer all the questions. Each question carries EIGHT marks.

5. Write a letter to your younger brother motivating him to deal with failures and hurdles in life. **(CO3)**
6. Write an essay in around120 words on the role of robots in the modern world. **(CO3)**
7. Read the following passage and answer the questions that follow: **(CO3)**

   The greatest enemy of mankind, as people have discovered, is not science, but war. Science merely reflects the social forces by which it is surrounded. It was found that when there is peace, science is constructive when there is war, science is perverted to destructive end. The weapons which science gives us do not necessarily create war. These make war increasingly more terrible. Until now, it has brought us on the doorstep of doom. Our main problem, therefore, is not to curb science, but to substitute law for force, and international government for anarchy in the relations of one nation with another. That is a job in which everybody must participate, including

the scientists. Now we are face to face with these urgent questions: Can education and tolerance, understanding and creative intelligence run fast enough to keep us side by side without our mounting capacity to destroy? That is the question which we shall have to answer, one way or the other, in this generation. Science must help us in the answer, but the main decision lies within ourselves. The hour is late and our work has scarcely begun.

a. What is the chief enemy of man?
b. What does science reflect?
c. When is science perverted?
d. What makes war more terrible?
e. Why do we need international government?
f. What are the four aspects that may stop destruction?
g. Have we really started our work to fight the problem discussed?
h. Pick the word from the passage that would mean: 'replace with other one'

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STATE BOARD OF TECHNICAL EDUCATION –A.P
C20-EE-101-ENGLISH
UNIT TEST-III

Time: 90 minutes **Max. Marks: 40**

PART-A **4X4 = 16 Marks**

Instructions: Answer all the questions. Each question caries Four marks.

1. Give the meaning of the word in italics: **(CO3)**
   a) When the girls laughed in the class, the teacher was *furious.*
   b) He was *rusticated* from the school for his misbehavior.
   c) Vikramaditya was a *benevolent* Indian King.
   d) We should not show any *discrimination* between boys and girls.

2. Change the speech of the following: **(CO2)**
   a) He said, "I am sorry."
   b) The teacher said to the boys, "Why are you late?"
   c) Sushma said that she had submitted her report recently.
   d) Pratap requested Priya to give him her pen.

3. Rewrite as directed: **(CO2)**
   a) Though he was weak, he took the test. (change into a simple sentence)
   b) You must work hard to achieve success. (change into a complex sentence)
   c) If you run fast, you will catch the bus. (change into a compound sentence)
   d) The fog disappeared when the Sun rose. (Split into two simple sentences)

4. Locate eight errors from the following passage and correct them. **(CO2)**

   Once upon a time there live a king who was very kind to his people. In his council of ministers, there is a wise man. He had a son called Sumanth who was a educated and highly learned. Once the wise minister fall sick. All the physicists in the country could not heal him. Then Sumanth will go in search of medicine in Himalayas. He bring the special medicinal roots to cure his father's sickness. Sumanth looked before his father carefully and healed him. The king rewarded Sumanth with rich gifts.

PART- B **3X8 = 24 Marks**

Instructions: Answer all the questions and each one carries eight marks.

5. Read the following paragraph and make notes first and then its summary. **(CO3)**

   Astronauts are people who travel on space ships. They need to have a very clean home. They travel far from Earth. We need clean kitchens everywhere on earth and in space. Astronauts have to solve two problems: how to get food and how to keep their spaceship clean. Here is how they solved the food problem. At first, the astronauts took tubes of food with them into space. They would squeeze a tube and eat semi-liquid food. It did not taste great, but since they did not need to take dishes or silverware with them, they had no dishes to wash. Today's spaceships have a bigger menu. Astronauts can eat from bowls. In fact, they take cereal and other standard foods with them. The foods are packaged in special containers to keep them fresh. They use knives, forks, and spoons. One unusual item on their table is a pair of scissors. They use the scissors to open the food packages. They can eat right from the package. They have a kitchen on the spaceship. Its oven can heat food to 170 degrees. The kitchen has water and sets of meals

that come on trays. The astronauts choose their menu before they go into space. They take a lot of food with them. The astronauts keep bread and fresh fruits and vegetables in a special food locker. How do they keep the kitchen clean? They do not have to worry about mice or other rodents. They make sure that there are no rodents before the ship leaves. But sometimes mice travel on the ship. Those mice are part of experiments. They live in cages. How do astronauts keep their trays clean? That is another health problem the astronauts solve. They need to stay healthy in space. To carry a lot of water to wash trays would be a lot of extra weight. They pack wet wipes in plastic bags. They use them to clean trays. So, their kitchen is clean and they stay healthy.

6. Write an essay in about 120 words on the importance of goal setting and your short and long term goals. (**CO3,CO4)**
7. Write a report about the bush fire that raged in Australia recently by using the following clues: forest, natural disaster, wild fire, dried leaves, no rain fall, wild animals, burnt alive, loss of flora and fauna, fire fighters, uncontrollable, moderate rains, environmental pollution, measures to protect...etc. **(CO3)**

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STATE BOARD OF TECHNICAL EDUCATION- A.P
Model Question Paper
C20-EE-101- ENGLISH

Time: 3hrs **Max.Marks:80**

PART-A **10X3=30 Marks**

Instructions: Answer all the questions. Each question carries Three marks.

1. a) Fill in the blanks with suitable articles: **(CO2)**
   I have seen _____ European at _____local market.
   b) Fill in with proper form of adjective given in the bracket: **(CO2)**
   China is the _____country in the world. (populous, more populous, most populous)
   c) i) Choose the synonym from the following for the word : 'filthy' **(CO3)**
   dirty / clean / hygienic / tidy
   ii) Choose the antonym from the following for the word: 'exterior' **(CO3)**
   external / internal / open / interior

2. a) i) Give prefix for the word: 'popular' **(CO2)**
   ii)Write suffix for the word : 'king' **(CO2)**
   b) He was married _____ her _____ January 2015. (Fill in with appropriate preposition) **(CO3)**
   c) Match the words in column A with their corresponding meanings in column B: **(CO2)**

Column-A	**Column-B**
i) Dynamic	a) tasty
ii) Gloomy	b) active
	c) sad
	d) proud

3. a) The old man *hunted* for his spectacles. (Give the contextual meaning of the word in italics) **(CO3)**
   b) The committee / have submitted / its report / to the President. (identify the part which contains an error) **(CO3)**
   c) Recently has a scooter purchased Shanthi. (Rearrange the jumbled words to make a meaningful sentence.) **(CO3)**

4. a) Use the following primary auxiliary verb in sentence of your own: **(CO2)**
   ' does'
   b) Fill in the blank with proper modal auxiliary verb based on the clue in the bracket: **(CO2)**
   Harish _____ speak four languages. (ability)
   c) Rakesh wants two hundred rupees from his father. (Write the sentence how he requests his Father) **(CO2)**

5. Fill in the blanks with suitable form of the verb given in brackets: **(CO2)**
   a) He _____ (go) for a walk daily.
   b) The bus _____ (arrive) just now.
   c) We _____ (live) in Chennai since 2005.

6. Change the voice of the following sentences: **(CO2)**
   a) English is spoken all over the world.
   b) They watched a movie yesterday.
   c) The Chief Minister will inaugurate the exhibition.

7. a) It is a beautiful rainbow. (Change into an exclamatory sentence) **(CO3)**
   b) C.V. Raman won the Nobel Prize in 1930. (Frame a question using 'When') **(CO3)**
   c) He can swim across the river. (change into 'Yes / No' question) **(CO3)**

8. Change the speech of the following: **(CO2)**
   a) He said, "I will go to Delhi tomorrow."
   b) Ravi said to Ashok, " Where are you going?"
   c) She told him to mind his own business.

9. Rewrite as directed: **(CO2)**
   a) In spite of being busy he attended the meeting. (Rewrite the sentence using 'though')
   b) She is poor. She is honest. (combine the two sentences using 'but')
   c) On seeing the tiger, he climbed a tree. (split into two simple sentences)

10. Rewrite the following sentences after making necessary corrections: **(CO2)**
    a) We have gone to picnic yesterday.
    b) Suresh watched T.V when I went to his house.
    c) They left Gujarat before the earthquake occurred.

PART-B **5X8=40**

Instructions: Answer the following questions. Each question carries EIGHT marks.

11. Write a paragraph in about 100 words on what you do daily. **(CO3,CO4)**

OR

Write a paragraph in about 100 words on the uses and misuses of social media.

12. Construct a dialogue of at least five turns between an American and you about places worth visiting in your city. **(CO3,CO4)**

OR

Compose a dialogue of at least five turns between two friends, one favouring homemade food and the other, fast foods.

13. Write a letter to your parents about your preparation for year-end examinations. **(CO3,CO4)**

OR

Write a letter to the editor of a newspaper about the inconvenience caused due to loud speakers in your area.

14. Write an essay in about 120 words on measures to prevent water pollution.

OR

Write an essay in about 120 words on importance of gender equality.

15. Read the following passage and answer the questions that follow: **(CO3)**

A farmer in ancient China had a neighbour who was a hunter, and who owned ferocious and poorly trained hunting dogs. They jumped over the fence frequently and chased the farmer's lambs. The farmer asked his neighbour to keep his dogs in check, but this fell on deaf ears. One day the dogs again jumped the fence, attacked and severely injured several of the lambs.

The farmer had had enough, and went to town to consult a judge who listened carefully to the story and said: "I could punish the hunter and instruct him to keep his dogs chained or lock them up. But you would lose a friend and gain an enemy. Which would you rather have, friend or foe for a neighbour?" The farmer replied that he preferred a friend. "Alright, I will offer you a solution that keeps your lambs safe, and which will keep your a neighbour a friend." Having heard the judge's solution, the farmer agreed.

Once at home, the farmer immediately put the judge's suggestions to the test. He took three of his best lambs and presented them to his neighbour's three small sons, who were beside themselves with joy and began to play with them. To protect his son's newly acquired playthings, the hunter built a strong kennel for his dogs. Since then, the dogs never again bothered the farmer's lambs. Out of gratitude for the farmer's generosity toward his sons, the hunter often shared the game he had hunted with the farmer. The farmer reciprocated by sending the hunter the cheese he had made. Within a short time the neighbours became good friends.

a) What kind of dogs does the neighbor have?
b) When did the farmer consult the judge?
c) What would be the consequence if the judge punished the neighbor?
d) What was the solution suggested by the judge?
e) What did the neighbour's sons do with the gifts they received?
f) How did the dogs stop bothering the farmer's lambs?
g) What items are exchanged happily between the two neighbours?
h) Pick the word from the passage that would mean: 'a closed shelter for dogs'.

OR

Read the following short poem and answer the questions that follow:

Crisp in the winter's morning,
Softly all through the night,
What is this without warning,
Falling and white?

I have never seen snow,
But I can imagine it quite –
Not how it tastes, but I know,
It falls and is white.

One morning I'll open the door,
To bring in the morning's milk,
And all around there'll be snow –
Fallen and still.

How I'll roll in the stuff!
How I'll tumble and spin!
Until the neighbours cry,
Enough!And send me back in.

Q.1. What is the poem about?
2. How does snow fall?
3. Did you ever touch snow? How did you feel?
4. a) Pick the word from the poem that means 'slip and fall'
b) Write the antonym for the word 'soft'

SECTION – C **1X10=10 Marks**

16. Write a report on the blood donation camp organized by International Red Cross Society in your college. Use the following clues: date, time, place, arrangements, donors, equipment, doctors, response, sponsors, snacks, volunteers, help others, save lives…etc.

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Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
EE-102	Engineering Mathematics-I	5	150	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Algebra	31	CO1
2	Trigonometry	44	CO2
3	Co-ordinate Geometry	23	CO3
4	Differential Calculus	33	CO4
5	Applications of Differentiation	19	CO4, CO5
	Total Periods	**150**	

Course Objectives	(i) To apply the principles of Algebra, Trigonometry and Co-Ordinate Geometry to real-time problems in engineering. (ii) To comprehend and apply the concept of Differential Calculus in engineering applications.

Course Outcomes	CO1	Identify various functions, resolve partial fractions and solve problems on matrices.
	CO2	Solve problems using the concept of trigonometric functions, their inverses and complex numbers.
	CO3	Find the equations and properties of straight lines, circles and conic sections in coordinate system.
	CO4	Evaluate the limits and derivatives of various functions.
	CO5	Evaluate solutions for engineering problems using differentiation.

ENGINEERING MATHEMATICS – I
COMMON TO ALL BRANCHES
Learning Outcomes
UNIT - I

C.O. 1 Identify various functions, resolve partial fractions and solve problems on matrices.

L.O. 1.1 Define Set, ordered pairs and Cartesian product - examples.
1.2 Explain Relations and functions – examples
1.3 Find Domain & Range of functions – simple examples.
1.4 Classify types of functions (into, many-to-one, one-one, onto and bijective).
1.5 Define inverse functions - examples.
1.6 Define rational, proper and improper fractions of polynomials.
1.7 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \frac{f(x)}{(ax+b)(cx+d)}$ $\qquad ii)\quad \frac{f(x)}{(ax+b)^2(cx+d)}$

$iii)\quad \frac{f(x)}{(x^2+a^2)(bx+c)}$ $\qquad iv)\quad \frac{f(x)}{(x^2+a^2)(x^2+b^2)}$

1.8 Define a matrix and order of a matrix.
1.9 State various types of matrices with examples (emphasis on 3^{rd} order square matrices).
1.10 Compute sum, scalar multiplication and product of matrices. Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.
1.11 Define the transpose of a matrix and write its properties;
1.12 Define symmetric and skew-symmetric matrices with examples Resolve asquare matrix into asum of a symmetric and skew- symmetric matrices and provide examples.
1.13 Define determinant of a square matrix, minor, co-factor of an element of a 3x3 square matrixwith examples. Expand the determinant of a 3 x 3 matrix using Laplace expansion formula. Stateand apply the properties of determinants to solve problems.
1.14 Distinguish singular and non-singular matrices. Define multiplicative inverseof a matrix and listproperties of adjoint and inverse. Compute adjoint and multiplicative inverse of a square matrix.
1.15 Solve system of 3 linear equations in 3 unknowns using Cramer's rule and matrix inversionmethod.

UNIT - II

C.O.2 Solve problems using the concept of trigonometric functions, their inverses and complex numbers.

L.O. 2.1 Define trigonometric ratios of any angle.
2.2 List the values of trigonometric ratios at specified values.
2.3 Draw graphs of trigonometric functions.
2.4 Explain periodicity of trigonometric functions.
2.5 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B).
2.6 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.
2.7 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.
2.8 Solve simple problems on compound angles.
2.9 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.
2.10 Derive useful allied formulas like $\sin^2 A = (1- \cos 2A)/2$ etc.
2.11 Solve simple problems using the above formulae

Syllabus for Unit test-I completed

2.12 Derive the formulae on transforming sum or difference of two trigonometric ratios into a product and vice versa, examples on these formulae.
2.13 Solve problems by applying these formulae to sum or difference or product of three or more terms.
2.14 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.
2.15 Define inverses of six trigonometric functions along with their domains and ranges.
2.16 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functions with examples.
2.17 State various properties of inverse trigonometric functions and identities like

$$\sin^{-1}x+\cos^{-1} x = \frac{\pi}{2} \text{ etc.}$$

2.18 Apply formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, *where* $x \geq 0, y \geq 0, xy < 1$ etc., to solve Simple problems.

2.19 Explain what is meant by solutions of trigonometric equations and find the general solutions of sin x=k, cos x =k and tan x=k with appropriate examples.

2.20 Solve models of the type a $\sin^2$ x + b sin x +c=0, a cos x + b sin x=c etc., and problems using simple transformations.

2.21 State sine rule, cosine rule, tangent rule and projection rule.

2.22 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter s and sides a,b,c and solve problems.

2.23 List various formulae for the area of a triangle.

2.24 Solve problems using the above formulae.

2.25 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.

2.26 Represent inverse hyperbolic functions in terms of logarithms.

2.27 Define complex number, its modulus , conjugate and list their properties.

2.28 Define the operations on complex numbers with examples.

2.29 Define amplitude of a complex number.

2.30 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form with examples.

2.31 Write DeMoivre's theorem (without proof) and illustrate with simple examples.

UNIT - III

Coordinate Geometry

C.O. 3 Find the equations and properties of straight lines, circles and conic sections in coordinate system.

L.O. 3.1 Write the different forms of a straight line – general form, point-slope form, slope-intercept form, two-point form, intercept form and normal form or perpendicular form.

3.2 Solve simple problems on the above forms.

3.3 Find distance of a point from a line, acute angle between two lines, intersection of two non parallel lines and distance between two parallel lines.

3.4 Define locus of a point and define a circle.

3.5 Write the general equation of a circle and find the centre and radius.

3.6 Find the equation of a circle given (i) centre and radius, (ii) two ends of a diameter (iii) Centre and a point on the circumference (iv) three non collinear points.

3.7. Define a conic section.

3.8 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.

3.9 Find the equation of a conic when focus, directrix and eccentricity are given.

3.10 Describe the properties of Parabola, Ellipse and Hyperbola in standard forms whose axes are along co-ordinate axes and solve simple examples on above.

Syllabus for Unit test-II completed

C.O.4 Evaluate the limits and derivatives of various functions.

L.O. 4.1 Explain the concept of limit and meaning of $\lim_{x\to a} f(x)=l$ and state the properties of limits.

4.2 Evaluate the limits of the type $\lim_{x\to l}\frac{f(x)}{g(x)}$ and $\lim_{x\to\infty}\frac{f(x)}{g(x)}$

4.3 Mention the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ (without proof) and solve the problems using these standard limits.

4.4 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

4.5 State the concept of derivative of a function y = f(x) – definition, first principleas $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

4.6 State the significance of derivative in scientific and engineering applications.

4.7 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

4.8 Find the derivatives of simple functions from the first principle .

4.9 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

4.10 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples.

4.11 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

4.12 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

4.13 Find the derivatives of hyperbolic functions.

4.14 Explain the procedures for finding the derivatives of implicit function with examples.

4.15 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.

4.16 Explain the concept of finding the higher order derivatives of second and third order with examples.

4.17 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.

4.18 Explain the definition of Homogenous function of degree n.

4.19 Explain Euler's theorem for homogeneous functions with applications to simple problems.

C.O. 5 Evaluate solutions for engineering problems using differentiation.

L.O. 5.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.

5.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

5.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x) .

5.4 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

5.5 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

5.6 Define the concept of increasing and decreasing functions.

5.7 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

5.8 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable- simple problems yielding maxima and minima.

5.9 Solve problems on maxima and minima in applications like finding areas, volumes etc.

5.10 Apply the concept of derivatives to find the errors and approximations in simple problems.

Syllabus for Unit test-III completed

CO/PO – Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	2				3	2	3
CO2	3	3	3	2				3	3	1
CO3	3	2	2	1				3	2	2
CO4	3	3	2	2				3	2	1
CO5	3	3	3	3				3	3	3
Avg	3	2.6	2.5	2				3	2.4	2

3 = Strongly mapped (High), **2 =**moderately mapped (Medium), **1 =**slightly mapped (Low)

Note:

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

PSO1: An ability to understand the concepts of basic mathematical concepts and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.

PSO2: An ability to solve the Engineering problems using latest software tool, along with analytical

skills to arrive at faster and appropriate solutions.

PSO3: Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

PO- CO – Mapping strength

PO no	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		No	%		
1	CO1, CO2, CO3,CO4,CO5	150	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3,CO4,CO5	138	92%	3	
3	CO1, CO2, CO3,CO4,CO5	133	88.6%	3	
4	CO1, CO2, CO3,CO4,CO5	120	80%	3	
PSO 1	CO1, CO2, CO3,CO4,CO5	150	100%	3	
PSO 2	CO1, CO2, CO3,CO4,CO5	135	90%	3	
PSO 3	CO1, CO2, CO3,CO4,CO5	125	83.3%	3	

COMMON TO ALL BRANCHES

COURSE CONTENT

Unit-I

Algebra

1. **Relations and Functions**:
   Define Set, Ordered pairs, Cartesian product, Relations, functions, domain & range of functions. Describe types of functions (in-to, many-to-one, one-one, onto and bijective) and inverse functions – examples.

2. **Partial Fractions:**
   Define rational, proper and improper fractions of polynomials. Resolve rational fractions in to their partial fractions covering the types mentioned below.

$i)\quad \dfrac{f(x)}{(ax+b)(cx+d)}$ $\qquad ii)\quad \dfrac{f(x)}{(ax+b)^2(cx+d)}$

$iii)\quad \dfrac{f(x)}{(x^2+a^2)(bx+c)}$ $\qquad iv)\quad \dfrac{f(x)}{(x^2+a^2)(x^2+b^2)}$

3. **Matrices:**
   Definition of a matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non-singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables-Solutions by Cramers's rule and Matrix inversion method-examples.

Unit-II
Trigonometry

4. **Trigonometric ratios:**
   Definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. **Compound angles:**
   Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.
6. **Multiple and sub multiple angles:**
   Formulae for trigonometric ratios of multiple angles 2A, 3A and sub multipleangles A/2 with problems.
7. Transformations of products into sums or differences and vice versa simple problems
8. **Inverse trigonometric functions:**
   Definition, domains and ranges-basic properties- problems.
9. **Trigonometric equations:**
   Concept of a solution, principal value and general solution of trigonometric equations: sinx =k , cosx= k, tanx =k, where k is a constant. Solutions of simple quadratic equations, equations involving usage of transformations- problems.
10. **Properties of triangles:**
    Relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- problems.
11. **Hyperbolic functions:**
    Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
12. **Complex Numbers:**
    Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitue (polar) form , Exponential form (Euler form) of a complex number- Problems. DeMoivre's theorem.

UNIT-III
Coordinate geometry

13. **Straight lines:** various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.

14. **Circle:** locus of a point, Circle, definition-Circle equation given (i) centre and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points - general equation of a circle – finding centre, radius.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola in standard forms.

UNIT-IV
Differential Calculus:

16. **Concept of Limit-** Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.
17. **Concept of derivative-** Definition (first principle)- different notations-derivatives of elementary functions- problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables - partial differentiation, Euler's theorem-simple problems.

UNIT-V
Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate measure –Problems.
20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.
21. Using the concept of derivative of a function of single variable, find the absolute error, relative and percentage errors and approximate values due to errors in measuring.

Textbook:

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. Shanti Narayan, A Textbook of matrices, S.Chand &Co.
2. Robert E. Moyer & Frank Ayers Jr., Schaum's Outline of Trigonometry, 4th Edition, Schaum's Series
3. M.Vygodsky, Mathematical Handbook, Mir Publishers, Moscow.
4. Frank Ayers & Elliott Mendelson, Schaum's Outline of Calculus, Schaum's Series

Engineering Mathematics – I
Blue print

S. No	Chapter/ Unit title	No of Periods		Weigh tage Allott ed	Marks wise distribution of weight age				Question wise distribution of weight age				COs map ped
	Unit - I : Algebra	**Theory**	**Practice**		**R**	**U**	**Ap**	**An**	**R**	**U**	**Ap**	**An**	
1	Relations and Functions	4	2	3	0	3	0	0	0	1	0	0	**CO 1**
2	Partial Fractions	3	2	3	0	3	0	0	0	1	0	0	**CO 1**
3	Matrices and Determinants	10	10	11	3	0	8	0	1	0	1	0	**CO 1**
	Unit - II : Trigonometry												
4	Trigonometric Ratios	1	1	0	0	0	0	0	0	0	0	0	**CO2**
5	Compound Angles	3	2	3	3	0	0	0	1	0	0	0	**CO2**
6	Multiple and Submultiple angles	4	4	3	0	3	0	0	0	1	0	0	**CO2**
7	Transformations	3	3	8	0	8	0	0	0	1	0	0	**CO2**
8	Inverse Trigonometric Functions	3	2										
9	Trigonometric Equations	3	2	8	0	0	8	0	0	0	1	0	**CO2**
10	Properties of triangles	3	2										
11	Hyperbolic Functions	1	1	0	0	0	0	0	0	0	0	0	**CO2**
12	Complex Numbers	4	2	3	3	0	0	0	1	0	0	0	**CO2**
	Unit III : Co-ordinate Geometry												
13	Straight Lines	4	2	3	3	0	0	0	1	0	0	0	**CO3**
14	Circle	3	2	8	0	8	0	0	0	1	0	0	**CO3**
15	Conic Sections	8	4										
	Unit – IV : Differential Calculus												
16	Limits and Continuity	4	2	3	0	3	0	0	0	1	0	0	**CO4**
17	Differentiation	17	10	14	3	11	0	0	1	2	0	0	**CO4**

	Unit - V : Applications of Differentiation												
18	Geometrical Applications	3	2	*	0	0	0	*	0	0	0	*	**CO5**
19	Physical Applications	2	2										
20	Maxima and Minima	3	4										
21	Errors and Approximations	2	1										
Total		**89**	**61**	**70+10***	**15**	**39**	**16**	**10***	**5**	**8**	**2**	**1**	

R: Remembering Type : 15 Marks
U: understanding Type : 39 Marks
Ap: Application Type : 16 Marks
An: Analysing Type : 10 Marks

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Engineering Mathematics – I
Unit Test Syllabus

Unit Test	Syllabus
Unit Test-I	From L.O. 1.1 to L.O. 2.11
Unit Test-II	From L.O. 2.12 to L.O. 3.10
Unit Test-III	From L.O.4.1 to L.O. 5.10

Unit Test I **C –20, EE -102**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code:**EE-102**

Time : 90 minutes Max.Marks:40

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each.

1. Answer the following.

   a. If $f(x)=x^2$ and domain $=\{-1,0,1\}$, then find range. (CO1)

   b. If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$, then find 3A. (CO1)

   c. Write the value of $Sin120^0$ (CO2)

   d. Write the formula for $\tan 2A$ in terms of $\tan A$ (CO2)

2. If $f:R\to R$ is defined by $f(x)=3x-5$, then prove that $f(x)$ is onto. (CO1)

3. If $A=\begin{bmatrix}1 & 3\\ 4 & -9\end{bmatrix}$, $B=\begin{bmatrix}2 & 4\\ -3 & 1\end{bmatrix}$ then find $2A+3B$ (CO1)

4. Prove that $Sin^2 45^0 - Sin^2 15^0 = \frac{\sqrt{3}}{4}$ (CO2)

5. Prove that $\frac{\sin 2A}{1-\cos 2A}=\cot A$ (CO2)

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Resolve $\frac{2x}{(x-1)(x-3)}$ into partial fractions. (CO1)

   (or)

   B) Resolve $\frac{x+4}{x^2-3x+2}$ into partial fractions. (CO1)

7. A) Using Cramer's rule to solve

$$x-y+z=2, 2x+3y-4z=-4, 3x+y+z=8$$ (CO1)

(or)

B) Prove that $\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = (a-b)(b-c)(c-a)$ (CO1)

8. A) Find the adjoint of Matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 5 \\ 2 & 7 & -4 \end{bmatrix}$ (CO1)

(or)

B) If $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 7 & 9 \\ -2 & 1 & 3 \end{bmatrix}$; $B = \begin{bmatrix} 3 & 1 & -5 \\ 2 & 1 & 4 \\ 0 & 3 & 1 \end{bmatrix}$, find AB and BA and verify if $AB = BA$.

(CO1)

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Unit Test II **C –20, EE-102**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **EE- 102**

Time : 90 minutes Max.Marks:40

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each

1. Answer the following.

   a. $\sin C + \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$: State TRUE/FALSE (CO2)

   b. If $z = 2+3i$, then find $|z|$ **(CO2)**

   c. $\sinh x = \frac{e^x - e^{-x}}{2}$: State TRUE/FALSE **(CO2)**

   d. Write the eccentricity of rectangular hyperbola. **(CO3)**

2. Express $(3-4i)(7+2i)$ in terms of $a+ib$ **(CO2)**

3. Find the perpendicular distance from $(1,1)$ to the line $2x+3y-1=0$ **(CO3)**

4. Find the angle between lines $2x-y+3=0$ and $x+y-2=0$ **(CO3)**

5. Find the centre and radius of the circle $x^2+y^2-2x+4y-4=0$ **(CO3)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Prove that $\frac{\sin 2\theta + \sin 4\theta + \sin 6\theta}{\cos 2\theta + \cos 4\theta + \cos 6\theta} = \tan 4\theta$. **(CO2)**

(or)

B) Prove that $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$ **(CO2)**

7. A) Solve $2\sin^2\theta - \sin\theta - 1 = 0$ **(CO2)**

(or)

B) In any ΔABC, If $\angle B = 60^0$ then $\frac{c}{a+b} + \frac{a}{b+c} = 1$ **(CO2)**

8. A) Find the equation of circle with $(2,3)$ and $(6,9)$ as the end points of diameter and also find centre and radius of circle. **(CO3)**

(or)

B) Find the equation of ellipse whose focus is $(1,-1)$, directrix is $x - y + 3 = 0$ and eccentricity is1/2. **(CO3)**

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Unit Test III **C –20, EE-102**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **EE-102**

Time : 90 minutes **Max.Marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each

1. Answer the following.
   a. Find $\lim_{x\to 1}\frac{x^2+1}{x+5}$ **(CO4)**
   b. $\lim_{\theta\to 0}\frac{\sin 2\theta}{\theta}=2$: State TRUE/FALSE **(CO4)**
   c. $\frac{d}{dx}\left(3\tan^{-1}x\right)=?$ **(CO4)**
   d. Formula for percentage error in x is _____ **(CO5)**

2. Evaluate $\lim_{x\to 2}\frac{x^5-32}{x^2-4}$ **(CO4)**

3. Find the derivative of $3\tan x-4\log x+7^x$ w.r.t. x **(CO4)**

4. Differentiate $x^2\sin x$ w.r.t. x **(CO4)**

5. Find the derivative of $\frac{2x+3}{3x+4}$ **(CO4)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t. $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$. **(CO4)**

(or)

B) Find $\frac{dy}{dx}$ if $y=x^{\cos x}$ **(CO4)**

7. A) Verify Euler's theorem when $u(x,y)=\dfrac{x^4+y^4}{x-y}$ **(CO4)**

(or)

B) Find the equation of tangent and normal to the curve $3y=x^2-6x+17$ at $(4,3)$ **(CO5)**

8. A) Circular patch of oil spreads on water and the area is growing at the rate of $8 sqcm/\min$. How fast is the radius increasing when radius is $5cm$. **(CO5)**

(or)

B) Find the maxima and minima values of $f(x)=x^3-6x^2+9x+15.$ **(CO5)**

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END-EXAM MODEL PAPERS

STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS C- 102

TIME : 3 HOURS **MODEL PAPER- I** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. If $A=\left\{0,\frac{\pi}{6},\frac{\pi}{4},\frac{\pi}{3},\frac{\pi}{2}\right\}$ and $f:A\to B$ is a function such that $f(x)=\cos x$, then find the range of f. **(CO1)**

2. Resolve the function $\frac{x}{(x-1)(x-2)}$ into partial fractions. **(CO1)**

3. If $\mathrm{A}=\begin{bmatrix}3 & 9 & 0\\ 1 & 8 & -2\end{bmatrix}$ and $\mathrm{B}=\begin{bmatrix}4 & 0 & 2\\ 7 & 1 & 4\end{bmatrix}$, find $\mathrm{A}+\mathrm{B}$ and $\mathrm{A}-\mathrm{B}$. **(CO1)**

4. Show that $\frac{\cos 16^0+\sin 16^0}{\cos 16^0-\sin 16^0}=\tan 61^0.$ **(CO2)**

5. Prove that $\frac{\sin 2\theta}{1-\cos 2\theta}=\cot\theta.$ **(CO2)**

6. Find the modulus of the complex number $\left(\frac{1-i}{2+i}\right)$. **(CO2)**

7. Find the distance between parallel lines $x+2y+3=0$ and $x+2y+8=0$. **(CO3)**

8. Find $\lim_{x\to 0}\frac{\sin 77x}{\sin 11x}$. **(CO4)**

9. Differentiate $3\tan x-4\log x-7x^2$ w.r.t. x. **(CO4)**

10. If $x=at^2, y=2at$, then find $\frac{dy}{dx}$. **(CO4)**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11 A) Find the inverse of the matrix $\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$. **(CO1)**

(or)

B) Solve the system of equations $x+y+z=6, x-y+z=2$ and $2x-y+3z=9$ by Cramer's rule. **(CO1)**

12 A) If $\cos x+\cos y=\frac{3}{5}$ and $\cos x-\cos y=\frac{2}{7}$, then show that **(CO2)**

$$21\tan\left(\frac{x-y}{2}\right)+10\cot\left(\frac{x+y}{2}\right)=0.$$

(or)

B) If $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\pi$ then show that $x+y+z=xyz.$ **(CO2)**

13 A) Solve $\sqrt{3}\cos\theta-\sin\theta=1.$ **(CO2)**

(or)

B) In any $\Delta ABC,$ Show that $\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}=\frac{s^2}{\Delta}.$ **(CO2)**

14 A) Find the equation of the circle with $(4,2)$ and $(1,5)$ as the two ends of its diameter and also find its centre and radius. **(CO3)**

(or)

B) Find the centre, vertices, equation of axes, lengths of axes, eccentricity, foci, equations of directrices and length of latus rectum of the ellipse $4x^2+16y^2=1.$ **(CO3)**

15 A) Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t. **(CO4)**

(or)

B) If $u=\tan^{-1}\left(\frac{x^3-y^3}{x+y}\right),$ then prove that **(CO4)**

PART-C

Answer the following question. Question carries TEN marks. 1x10=10M

16. The sum of two numbers is 24. Find them so that the sum of their squares is minimum. **(CO5)**

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STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS C- 102

TIME : 3 HOURS **MODEL PAPER- II** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. If $\lim_{x\to 0}\frac{\tan x}{x}$, is a bijective function such that $\lim_{x\to 0}\frac{a^x-1}{x}$, then find $\lim_{x\to 0}\frac{e^x-1}{x}$, **CO1**

2. Resolve the function $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, into partial fractions. **CO1**

3. If $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ is a skew-symmetric matrix, find the value of $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ **CO1**

4. Find the value of $\frac{f(x)}{(ax+b)(cx+d)}$ **CO2**

5. Prove that $\frac{f(x)}{(ax+b)^2(cx+d)}$ **CO2**

6. Find the conjugate of the complex number $\frac{f(x)}{(x^2+a^2)(bx+c)}$ **CO2**

7. Find the equation of the line passing through the points $\frac{f(x)}{(x^2+a^2)(x^2+b^2)}$ and $f(x)=x^2$ **CO3**

8. Find $=\{-1,0,1\}$, **CO4**

9. Differentiate $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$ w.r.t. x. **CO4**

10. If $\tan 2A$ then find $\tan A$ and $f:R\to R$ **CO4**

PART-B

Answer All questions. Each question carries EIGHT marks. 5x8=40M

11 A) Show that $f(x)=3x-5$ **CO1**

Or

B) Solve the system of equations $f(x)$ and $A=\begin{bmatrix}1 & 3\\ 4 & -9\end{bmatrix}$ using matrix inversion method. **CO1**

12 A) Prove that $B=\begin{bmatrix} 2 & 4 \\ -3 & 1 \end{bmatrix}$ **CO2**

Or

B) Prove that $2A+3B$ **CO2**

13 A) Solve $Sin^2 45^0 - Sin^2 15^0 = \frac{\sqrt{3}}{4}$ **CO2**

Or

B) In any $\Delta ABC,$ Show that $\frac{2x}{(x-1)(x-3)}$ **CO2**

14 A) Find the equation of the circle passing through the points $\frac{x+4}{x^2-3x+2}$ and $x-y+z=2, 2x+3y-4z=-4, 3x+y+z=8$ **CO3**

Or

B) Find the equation of the rectangular hyperbola whose focus is $\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = (a-b)(b-c)(c-a)$ and directrix is $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 5 \\ 2 & 7 & -4 \end{bmatrix}$ **CO3**

15 A) If $A=\begin{bmatrix} 2 & 3 & 4 \\ 5 & 7 & 9 \\ -2 & 1 & 3 \end{bmatrix}$ then prove that $B=\begin{bmatrix} 3 & 1 & -5 \\ 2 & 1 & 4 \\ 0 & 3 & 1 \end{bmatrix}$ **CO4**

Or

B) If $AB=BA$ then prove that $\sin C+\sin D=2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$ **CO4**

PART-C

Answer the following question. Question carries TEN marks. 1x10=10M

16 Show that the semi-vertical angle of the cone of maximum volume and of given slant height is $z=2+3i$ **CO4**

Course code	Course Title	No. of Periods per week	Total No. of Periods	Marks for FA	Marks for SA
EE-103	Engineering Physics	4	120	20	80

S. No	Unit Title/Chapter	No of Periods	COs Mapped
1	Units and Dimensions	08	CO1
2	Elements of Vectors	12	CO1
3	Dynamics	12	CO2
4	Friction	10	CO2
5	Work, Power and Energy	12	CO3
6	Simple harmonic motion	12	CO3
7	Heat and Thermodynamics	12	CO4
8	Sound	10	CO4
9	Properties of matter	10	CO5
10	Electricity and Magnetism	12	CO5
11	Modern physics	10	CO5
Total		**120**	

Course Title: Engineering Physics	
Course Objectives	1. To familiarize with the concepts of Physics involved in the process of various Engineering, Industrial and Daily life Applications. 2. To understand and apply the basic principles of physics in the field of engineering and technology to familiarize certain natural phenomenon occurring in the day to day life 3. To reinforce theoretical concepts by conducting relevant experiments/exercises

Course Outcomes	CO1	Explain S.I units and dimensions of different physical quantities, basic operations among vector quantities.
	CO2	Explain the motion of objects moving in one dimension and two dimensions, the causes of motion and hindrance to the motion of the objects especially with respect to friction.
	CO3	Explain the mechanical energy of bodies like PE, KE and conservation law of energy, the properties of simple harmonic motion.
	CO4	Explain gas laws, ideal gas equation, Isothermal and adiabatic processes, Specific heats, to study the laws of thermodynamics. Causes, consequences and methods to minimise noise pollution, explain beats, Doppler effect, Reverberation, echoes.

	CO5	Explain certain properties of solids, liquids like elastic properties, viscosity and surface tension. Explain Ohm's law, to study Kirchoff's laws, to study the principle of Wheatstone's bridge and its application to meter bridge. To study the magnetic force and understand magnetic field. To compute magnetic field strength on axial and equatorial lines of a bar magnet. To familiarise with modern topics like photoelectric effect, optical fibres, superconductivity and nanotechnology.

COS, POS, PSOS MAPPING

- POs mapping strength (as per given table)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3					1		1	1	1
CO2	3		2					1	1	
CO3	3		2					1		
CO4	3	2			2				2	2
CO5	3			2			2	1	1	

3 = strongly mapped 2= moderately mapped 1= slightly mapped

Note:The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
i) Seminars ii) Tutorials iii) Guest lectures iv) Assignments v) Quiz competitions vi) Industrial visits vii) Tech Fest viii) Mini project ix) Group discussion x) Virtual classes xi) Library visit for e-books

Learning Outcomes

1.0 Concept of Units and dimensions

1.1 Explain the concept of Units, Physical quantity, Fundamental physical quantities and Derived physical quantities
1.2 Define unit, fundamental units and derived units, State SI units with symbols
1.3 State Multiples and submultiples in SI system, State Rules of writing S.I. units, State advantages of SI units
1.4 Define Dimensions, Write Dimensional formulae of physical quantities
1.5 List dimensional constants and dimensionless quantities
1.6 State the principle of homogeneity of dimensions
1.7 State the applications and limitations of dimensional analysis
1.8 Errors in measurement, Absolute error, relative error, percentage error, significant figures
1.9 Solve problems

2.0 Concept of Elements of Vectors

2.1 Explain the concept of scalars, Vectors and give examples
2.2 Represent vectors graphically, Classify the Vectors, Resolve the vectors
2.3 Determine the resultant of a vector by component method, represent a vector in Space using unit vectors (i, j, k)
2.4 State and explain triangle law, parallelogram law, and polygon law of addition of Vectors
2.5 Define Dot product of two vectors with examples (Work done, Power), mention the Properties of dot product

2.6 Define cross product of two vectors with examples (Torque, Linear velocity) Mention the properties of Cross product.

2.7 Solve the related numerical problems

3.0 Concept of Dynamics

3.1 Write the equations of motion in a straight line. Explain the acceleration due to Gravity.

3.2 Explain vertical motion of a body and derive expressions for a) Maximum Height, b) Time of ascent, c) time of descent, and d) time of flight

3.3 Derive height of a tower when a body projected vertically upwards from the top of a tower.

3.4 Explain projectile motion with examples

3.5 Explain horizontal projection and derive an expression for the path of a projectile in horizontal projection

3.6 Explain oblique projection and derive an expression for it. Derive formulae for a) Maximum Height b) time of ascent c) time of descent and d) time of flight e) Horizontal Range, f) Maximum range

3.7 Define force, momentum, angular displacement, angular velocity, angular acceleration, angular momentum, moment of inertia, torque

3.8 Solve the related numerical problems

4.0 Concept of Friction

4.1 Define friction and classify the types of friction.

4.2 Explain the concept of normal reaction.

4.3 State the laws of friction.

4.4 Define coefficients of friction, Angle of friction and angle of repose.

4.5 Derive expressions for acceleration of a body on a rough inclined plane. (Upwards and downwards)

4.6 List the advantages and disadvantages of friction.

4.7 Mention the methods of minimizing friction.

4.8 Explain why it is easy to pull a lawn roller than to push it.

4.9 Solve the related numerical problems.

5.0 Concepts of Work, Power, and Energy

5.1 Define the terms Work, Power and Energy. State SI units and dimensional Formulae.

5.2 Define potential energy and give examples, derive an expression for potential energy.

5.3 Define Kinetic energy and give examples, derive an expression for kinetic energy.

5.4 State and derive Work-Energy theorem.

5.5 Derive the relation between Kinetic energy and momentum.

5.6 State the law of conservation of energy and verify it in the case of a freely falling body.

5.7 Solve the related numerical problems.

6.0 Concepts of Simple harmonic motion

6.1 Define Simple harmonic motion, Give examples, state the conditions.

6.2 Explanation of uniform circular motion of a particle is a combination of two perpendicular S.H.M.s.

6.3 Derive expressions for displacement, velocity, acceleration, Frequency, Time period of a particle executing SHM.

6.4 Define phase of SHM.

6.5 Define Ideal simple pendulum and derive expression for time period of simple pendulum.

6.6 State the laws of motion of simple pendulum.

6.7 Solve the related numerical problems.

7.0 Concept of heat and thermodynamics

7.1 Explain the concept of expansion of gases

7.2 State and explain Boyle's and Charles laws.

7.3 Define absolute zero temperature, absolute scale of temperature

7.4 Define ideal gas and distinguish from real gas

7.5 Derive Ideal gas equation. Define specific gas constant and universal gas constant, write S.I unit and dimensional formula. Calculate the value of R.

7.6 Explain why universal gas constant is same for all gases

7.7 State and explain isothermal process and adiabatic process

7.8 State first and second laws of thermodynamics and state applications

7.9 Define specific heats and molar specific heats of a gas, Derive C_P-C_V =R

7.10 Solve the relevant numerical problems

8.0 Concept of Sound

8.1 Concept of the sound, Wave motion. (longitudinal and transverse wave)

8.2 Distinguish between musical sound and noise.

8.3 Explain noise pollution and state SI unit for intensity level of sound.

8.4 Explain causes, effects and methods of minimizing of noise pollution.

8.5 Explain the phenomenon of beats state the applications.

8.6 Define Doppler effect, list the applications.

8.7 Define reverberation and reverberation time and write Sabine's formula.

8.8 Define and explain echoes state its applications.

8.9 State conditions of good auditorium.

8.10 Solve the related numerical problems.

9.0 Concepts of properties of matter

9.1 Explain the terms elasticity, stress, strain and types of stress and strain.

9.2 State and explain Hooke's law.

9.3 Definitions of Modulus of elasticity, Young's modulus(Y), Bulk modulus (K), Rigidity modulus (n),Poisson's ratio (σ),

9.4 Define surface tension and give examples.

9.5 Explain Surface tension with reference to molecular theory.

9.6 Define angle of contact and capillarity and write formula for Surface Tension.

9.7 Explain the concept of viscosity, give examples, write Newton's formula.

9.8 Define co-efficient of viscosity and write its units and dimensional formulaand State Poiseulle's equation for Co-efficient of viscosity.

9.9 Explain the effect of temperature on viscosity of liquids and gases.

9.10 Solve the related numerical problems.

10. Concepts of Electricity and Magnetism

10.1 Explain Ohm's law in electricity and write the formula.
10.2 Define specific resistance, conductance and state their units.
10.3 Explain Kichoff's laws.
10.4 Describe Wheatstone's bridge with legible sketch.
10.5 Describe Meter Bridge for the determination of resistivity with a circuit diagram.
10.6 Explain the concept of magnetism. State the Coulomb's inverse square law of Magnetism.
10.7 Define magnetic field and magnetic lines of force and write the properties of magnetic lines of force.
10.8 Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field.
10.9 Derive equations for Magnetic induction field strength at a point on the axial line and on the equatorial line of a bar magnet.
10.10 Solvethe related numerical problems

11.0 Concepts of modern physics

11.1 State and explain Photo-electric effect and Write Einstein's photo electric Equation.
11.2 State laws of photo electric effect.
11.3 Explain the Working of photo electric cell, write its applications.
11.4 Recapitulation of refraction of light and its laws, critical angle, total Internal Reflection.
11.5 Explain the principle and working of Optical fiber, mention different types of Optical fiber, state the applications.
11.6 Define super conductor and super conductivity and mention examples.
11.7 State the properties of super conducting materials and list the applications.
11.8 Nanotechnology definition, nano materials, applications.

COURSECONTENT

1. Units and Dimensions:

Introduction, Physical quantity, Fundamental and Derived quantities, Fundamental and Derived units, SI units, Multiples and Sub multiples, Rules for writing S.I. units, Advantages of SI units. Dimensions and Dimensional formulae, Dimensional constants and Dimensionless quantities, Principle of homogeneity, Advantages and limitations of dimensional analysis, Errors in measurement, Absolute error, relative error, percentage error, significant figures, Problems.

2. Elements of Vectors:

Scalars and Vectors, Types of vectors (Proper Vector, Null Vector, Unit Vector, Equal, Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors, Representation of vectors, Resolution of vectors, Parallelogram, Triangle and Polygon laws of vectors, Subtraction of vectors, Dot and Cross products of vectors-Problems.

3. Dynamics

Introduction-Concept of acceleration due to gravity-Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections-Expressions for maximum height, time of flight, range-Define force, momentum, angular displacement, angular velocity, angular acceleration, angular momentum, moment of inertia, torque–problems.

4. Friction:

Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction- rough inclined plane- Advantages and disadvantages of friction-Methods of reducing friction–Problems.

5. Work, Power and Energy:

Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy- Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems.

6. Simple Harmonic Motion:

Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum-Problems.

7. Heat and Thermodynamics:

Expansion of Gases, Boyle's law, absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between gas constant(r) and universal gas constant(R),Isothermal and adiabatic processes, Laws of thermodynamics, Specific heats - molar specific heats of a gas -Different modes of transmission of heat ,laws of thermal conductivity, Coefficient of thermal conductivity-Problems.

8. Sound:

Sound- Nature of sound- Types of wave motion -musical sound and noise- Noise pollution – Causes &effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo-Reverberation-Reverberation time-Sabine 's formula-Conditions of good auditorium-Problems.

9. Properties of matter

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law-Definitions of Modulus of elasticity, Young's modulus(Y), Bulk modulus(K), Rigidity modulus (n),Poisson's ratio (σ), relation between Y, K, n and σ(equations only no derivation)

Definition of surface tension-Explanation of Surface tension with reference to molecular theory - Definition of angle of contact -Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseuille's equation for Co-efficient of viscosity- The related numerical problems.

10. Electricity & Magnetism:

Ohm's law and explanation, Specific resistance, Kirchoff's laws, Wheatstone's bridge, Meter bridge, Coulomb's inverse square law, magnetic field, magnetic lines of force, magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line–problems.

11. Modern Physics;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect-photoelectric cell–Applications of photo electric effect- Total internal reflection- fiber optics--principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- superconductivity–applications-Nanotechnology definition, nano materials, applications

REFERENCEBOOKS

1. Telugu Academy (English version)	Intermediate physics Volume-I & 2
2. Dr. S. L. Guptha and Sanjeev Guptha	Unified physics Volume 1,2,3 and 4
3. Resnick& Holiday	Text book of physics Volume I
4. Dhanpath Roy	Text book of applied physics
5. D.A Hill	Fiber optics
6. XI & XII Standard	NCERT Text Books

- **Model Blue Print with Weightage for Blooms category and questions for chapter and Cos mapped**

S. No	Unit Title/Chapter	No of Periods	Weightage of marks	Marks wise distribution of Weightage				Question wise distribution of Weightage				Mapped with CO
				R	U	Ap	An	R	U	Ap	An	
1	Units and Dimensions	08	03	3	0	0	0	1	0	0	0	CO1
2	Elements of Vectors	12	11	3	8	0	0	1	1	0	0	CO1
3	Dynamics	12	11	3	8	0	0	1	1	0	*	CO2
4	Friction	10	11	3	0	8	0	1	0	1	0	CO2
5	Work, Power and Energy	12	11	3	8	0	0	1	1	0	0	CO3
6	Simple harmonic motion	12	11	3	8	0	0	1	1	0	*	CO3
7	Heat and Thermodynamics	12	11	0	8	3	0	0	1	1	*	CO4
8	Sound	10	11	0	8	3	0	0	1	1	0	CO4
9	Properties of matter	10	08	0	8	0	0	0	1	0	0	CO5
10	Electricity and Magnetism	12	14	6	0	8	0	2	0	1	0	CO5
11	Modern physics	10	08	0	8	0	0	0	1	0	0	CO5
Total		**120**	**110**	**24**	**64**	**22**	**0**	**8**	**8**	**4**	***10**	

***One question of HOTs for 10 marks from any of the unit title 3 or 6 or 7**

- **Table specifying the scope of syllabus to be covered for Unit Tests**

Unit Test	Learning outcomes to be covered
Unit Test – 1	From 1.1 to 4.9
Unit Test – 2	From 5.1 to 7.10
Unit Test – 3	From 8.1 to 11.8

- **Model question paper for Unit Tests I,II,III with COs mapped**

UNIT TEST –I

Model Question Paper (C-20)

ENGINEERING PHYSICS (EE-103)

TIME: 90 minutes Total Marks: 40

PART-A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and others carry 3 marks each.
(3) Answers for the Question numbers 2 to 5 should be brief andstraight to the point and shall not exceed five simple sentences.

1. i) The dimensional formula of force is _____ **(CO1)**
   ii) Which of the following is a scalar [ ] **(CO1)** a) force b) work c) displacement d) velocity
   iii) We can add a scalar to a vector (Yes / No) **(CO1)**
   iv) Friction is a self-adjusting force. [True / False] **(CO2)**
2. Define dot product. Give one example. **(CO1)**
3. A force of 150 N acts on a particle at an angle of 30° to the horizontal. Find the horizontal and vertical components of force. **(CO1)**
4. Define projectile. Give two examples. **(CO2)**
5. It is easier to pull a lawn roller than to push it. Explain **(CO2)**

PART—B **3x8=24 Marks**

Instructions: (1) Answer all questions. Each question carries 8marks.
(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.

6) (A) Derive an expression for magnitude and direction of resultant of two Vectors using parallelogram law of vectors **(CO1)**

OR

(B) Write any four properties of dot product and any four properties of Cross product **(CO1)**

7) (A) Show that path of a projectile is a parabola in case of obliqueProjection. **(CO2)**

OR

(B) Derive the expression for range and time of flight of a projectile **(CO2)**

8) (A) State and explain polygon law of vector addition with a neat diagram **(CO1)**

OR

(B) Derive the equation for acceleration of a body on a rough inclined plane **(CO2)**

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UNIT TEST –II

Model Question Paper (C-20)

ENGINEERING PHYSICS (EE–103)

TIME: 90 minutes Total Marks: 40

PART –A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and others carry 3 marks each.
(3) Answers for the Question numbers 2 to 5 should be brief and Straight to the point and shall not exceed five simple sentences.

1) i) The value of 100^0 C is equal to _____ in Kelvin scale of temperature **(CO4)**
ii) Write the S.I unit of power **(CO3)**
iii) A simple pendulum be used in artificial satellite (Yes / No) **(CO3)**
iv) Specific heat of a gas is constant for all gases in nature [True / False] **(CO4)**

2. Derive the relation between momentum and kinetic energy **(CO3)**

3. A girl is swinging by sitting in a swing, how the frequency changes if she stands in the swing. **(CO3)**

4. Write the physical significance of universal gas constant. **(CO4)**

5. A body is projected in to the air in the vertically upward direction, find the height at which its potential and kinetic energies are equal. **(CO3)**

PART—B **3x8=24 Marks**

Instructions:(1) Answer all questions. Each question carries 8marks.
(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.

6) (A) State the law of conservation of energy and verify it in case of a freely falling body. **(CO3)**

(OR)

(B) State and prove work energy theorem. **(CO3)**

7) (A) Define ideal simple pendulum and derive the equation for time period of a simple pendulum **(CO3)**

(OR)

(B) State the conditions for S.H.M, derive the equation for velocity for a Particle in S.H.M. **(CO3)**

8) (A) Define ideal gas, show that for an ideal gas the difference in specific heats is equal to universal gas constant **(CO4)**

(OR)

(B) State gas laws and derive the ideal gas equation **(CO4)**

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UNIT TEST –III

Model Question Paper (C-20)

ENGINEERING PHYSICS (EE–103)

TIME: 90 minutes Total Marks: 40

PART –A 16 Marks

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and others carry 3 marks each.
(3) Answers for the Question numbers 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1) i) Photo electric cell converts light energy in to _____ energy **(CO5)**
ii) What is elastic limit ? **(CO5)**
iii) SI unit of Specific resistance is ---------- **(CO5)**
iv) Inside a bar magnet magnetic line of force will travel from North pole to South pole [True / False] **(CO5)**
2. Distinguish between Musical sound and Noise **(CO4)**
3. What is the effect of temperature on Viscosity of liquids and gases **(CO5)**
4. The values of resistances P, Q, R are 50 Ω, 10Ω, 15 Ω respectively in the balanced condition of Wheatstone bridge, find the unknown resistance **(CO5)**
5. What is nanotechnology and write any two uses. **(CO5)**

PART—B 3x8=24 Marks

Instructions: (1) Answer all questions. Each question carries 8marks.
(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.

6) (A) Explain Surface Tension based on the molecular theory **(CO5)**
(OR)
(B) Define Reverberation and Reverberation Time. Derive Sabine formula for reverberation time. **(CO4)**

7) (A) Derive the balancing condition of Wheatstone bridge with neat circuit Diagram. **(CO5)**
(OR)
(B) Derive an expression for the magnetic induction field strength at a point on the equatorial line of a bar magnet. **(CO5)**

8) (A) Describe an experiment to determine the specific resistance of a wire using meter bridge. **(CO5)**
(OR)
(B) Explain the principle and working of an optical fiber. **(CO5)**

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BOARD DIPLOMA EXAMINATION, (C–20)
FIRST YEAR EXAMINATION
EE–103, ENGINEERING PHYSICS

Time : 3 hours] [Total Marks : 80M

PART—A **3×10=30**

Instructions: (1) Answer all questions.
(2) Each question carries three marks.
(3) Answers should be brief and straight to the point and shall not exceed five simple Sentences.

1. Write the dimensional formula of the following physical quantities **(CO1)**
   (a) Velocity (b) Force (c) Angular momentum
2. Write any three properties of scalar product. **(CO1)**
3. Define projectile. Give two examples. **(CO2)**
4. It is easier to pull a lawn roller than to push it. Explain. **(CO2)**
5. Define potential energy and kinetic energy. **(CO3)**
6. For a body in simple harmonic motion velocity at mean position is 4m/s, if the time period is 3.14 s, find its amplitude. **(CO3)**
7. State first and second laws of thermodynamics. **(CO4)**
8. Write any three conditions of good auditorium **(CO4)**
9. Define ohmic and non-ohmic conductors. **(CO5)**
10. State Coulomb's inverse square law of magnetism. **(CO5)**

PART—B **8 ×5= 40**

Instructions: (1) Each question carries eight marks.
(2) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. A) Derive an expression for magnitude and direction of the resultant of two vectors using Parallelogram law of vectors. **(CO1)**

OR

B) Show that path of a projectile is parabola in case of oblique projection and derive expression for maximum height. **(CO2)**

12. A) Derive expression for acceleration of a body sliding downwards on a rough inclined plane**.** **(CO2)**

OR

B) Verify the law of conservation of energy in case of a freely falling body**.** **(CO3)**

13. A) Derive an expression for velocity and acceleration of a particle performing simple harmonic Motion. **(CO3)**

OR

B) Define ideal gas and derive ideal gas equation**.** **(CO4)**

14. A) Two tuning forks A and B produce 4 beats per second. On loading B with wax 6 beats are produced. If the quantity of wax is reduced the number of beats drops to 4. If the frequency of A is 326 Hz, find the frequency of B**.** **(CO4)**

OR

B) Explain surface tension based on molecular theory. Write three examples of surface tension.
(CO5)

15. A) Derive an expression for balancing condition of Wheat stone's bridge with a neat circuit diagram. **(CO5)**

OR

B) Explain principle and working of optical fibers. Write any three applications . **(CO5)**

PART C **1x10=10**

16) Derive relationship between molar specific heat of a gas at constant pressure C_p and molar specific heat of a gas at constant volume C_v and hence show that C_p is greater than C_v. **(CO4)**

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Course code	Course Title	No. of Periods per week	Total No. of Periods	Marks for FA	Marks for SA
EE-104	Engineering Chemistry and Environmental Studies	4	120	20	80

S.No	Unit Title/Chapter	No of Periods	COs Mapped
1	Fundamentals of Chemistry	18	CO1
2	Solutions	10	CO1
3	Acids and bases	10	CO1
4	Principles of Metallurgy	8	CO1
5	Electrochemistry	16	CO2
6	Corrosion	8	CO2
7	Water Treatment	10	CO3
8	Polymers	12	CO4
9	Fuels	6	CO4
10	Chemistry in daily life	6	CO4
11	Environmental Studies	16	CO5
	Total	**120**	

- **Course Objectives**

Course Title: Engineering Chemistry & Environmental Studies	
Course Objectives	1. To familiarize with the concepts of chemistry involved in the process of various Engineering Industrial Applications. 2. To know the various natural and man-made environmental issues and concerns with an interdisciplinary approach that include physical, chemical, biological and socio cultural aspects of environment. 3. To reinforce theoretical concepts by conducting relevant experiments/exercises

- **Course outcomes**

Course Outcomes	CO1	Explain Bohr`s atomic model, chemical bonding, mole concept, acids and bases, P^H metallurgical process and alloys
	CO2	Explain electrolysis, Galvanic cell, emf and corrosion
	CO3	Explain the chemistry involved in the treatment of water by advanced method
	CO4	Synthesise of Plastics, rubber and applications of fuel chemical compounds used in our daily life.
	CO5	Explain the causes, effects and control methods of air and water pollution and measures to protect the environment

Course code EE-104	**Engg. Chemistry and Environmental studies No of Cos;5**			**No Of periods 120**
	Mapped with CO No	**CO periods addressing PO in Col 1 NO %**	**1,2,3**	**remarks**
	CO1,CO2,CO3, CO4,CO5			>40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed)
	CO1,CO2			
	CO2,CO3			
	CO4,CO5			

- **COs-POs mapping strength (as per given table)**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1		1				1	1	
CO2	3	1	2					1	1	
CO3	3		2							
CO4	3				1		2			
CO5	3				3			1		

3 = strongly mapped
2= moderately mapped
1= slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

➢ **Model Blue Print with Weightage for Blooms category and questions for each chapter and COs mapped**

S.No	Unit Title/Chapter	No of Periods	Weightage of marks	Marks wise distribution of Weightage				Question wise distribution of Weightage				Mapped with CO
				R	U	Ap	An	R	U	Ap	An	
1	Fundamentals of Chemistry	18	19	8	8	3		1	1	1		CO1
2	Solutions	10	11	0	0	8	3			1	1	CO1
3	Acids and bases	10	11	0	8	0	3		1		1	CO1
4	Principles of Metallurgy	8	8	8	0	0		1				CO1
5	Electrochemistry	16	11	8	3	0		1	1		*	CO2
6	Corrosion	8	8	0	8	0			1			CO2
7	Water Treatment	10	11	8	3	0		1	1			CO3
8	Polymers	12	11	3	8	0		1	1		*	CO4
9	Fuels	6	3	3	0	0		1				CO4
10	Chemistry in daily life	6	3	0	0	3				1		CO4
11	Environmental Studies	16	14	3	11	0		1	2			CO5
Total		**120**	**110**	**12**	**6**	**6**	**6**	**20**	**35**	**5**	***10**	

***One question of HOTs for 10 marks from any of the unit title 5 or 8**

Upon completion of the course the student shall be able to learn out

ENGINEERINGCHEMISTRY AND ENVIRONMENTAL STUDIES

1.0 Atomic structure

1.1 Explain the charge, mass of fundamental particles of an atom (electron, proton and neutron) and the concept of atomic number and mass number.

1.2 State the Postulates of Bohr's atomic theory and its limitations.

1.3 Explain the significance of four Quantum numbers.

1.4 Explain 1. Aufbau principle, 2 Pauli's exclusion principle 3 Hund's rule.

1.5 Define Orbital of an atom and draw the shapes of s, p and d- Orbitals.

1.6 Write the electronic configuration of elements up to atomic number 30

1.7 Explain the significance of chemical bonding

1.8 Explain the Postulates of Electronic theory of valency

1.9 Define and explain Ionic and Covalent bonds with examples of NaCl , MgO, *H_2,*O_2 and *N_2. (* Lewis dot method)

1.10 List out the Properties of Ionic compounds and covalent compounds and distinguish between their properties.

1.11 Structures of ionic solids-define a) Unit cell b) co-ordination number and the structures of NaCl and CsCl unit cells.

2.0 Solutions

2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent
2.2 Classify solutions based on physical state and solubility
2.3 Define mole and problems on mole concept.
2.4 Define the terms 1. Atomic weight, 2.Molecular weight and 3. Equivalent weight and calculate Molecular weight and Equivalent weight of the given acids.(HCl, H_2SO_4, H_3PO_4)Bases ($NaOH$, $Ca(OH)_2$, $Al(OH)_3$) and Salts ($NaCl$, Na_2CO_3, $CaCO_3$)
2.5 Define molarity and normality and numerical problems on molarity and normality
a) Calculate the Molarity or Normality if weight of solute and volume of solution are given
b) Calculate the weight of solute if Molarity or normality with volume of solution are given
c) Problems on dilution to convert high concentrated solutions to low concentrated Solutions

3.0 Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases and give the limitations of Arrhenius theory of Acids and Bases.
3.2 Explain Bronsted–Lowry theory of acids and bases and give the limitations of Bronsted–Lowry theory of acids and bases.

3.3 Explain Lewis theory of acids and bases and give the limitations of Lewis theory of acids and bases.
3.4 Explain the Ionic product of water
3.5 Define pH and explain P^H scale and solve the Numerical problems on pH(Strong Acids and Bases)
3.6 Define and explain buffer solution and give the examples of buffer solutions.
3.7 State the application of buffer solutions

4.0 Principles of Metallurgy

4.1 List out the Characteristics of Metals and non-metals
4.2 Distinguish between Metals and Non-metals
4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4.Flux5.Slag
4.4 Describe the methods of concentration of Ore; 1.Handpicking, 2.Levigation and 3. Froth Floatation
4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.
4.6 Explain the purification of Copper by Electrolytic Refining
4.7 Define an Alloy and Write the composition and uses of the following alloys. 1. Brass 2. Germen silver 3. Nichrome.

5.0 Electrochemistry

5.1 Define the terms1. Conductor 2. Semiconductor 3.Insulator, 4.Electrolyte5.Non–electrolyte.Give two examples each.
5.2 Distinguish between metallic conduction and Electrolytic conduction
5.3 Explain electrolysis by taking example fused NaCl
5.4 Explain Faraday's laws of electrolysis
5.5 Define 1.Chemical equivalent (E) 2.Electrochemicalequivalent (e) and their relation.
5.6 Solve the Numerical problems on Faraday's laws of electrolysis and applications of electrolysis (Electro plating)
5.7 Define Galvanic cell and explain the construction and working of Galvanic cell.
5.8 Distinguish between electrolytic cell and galvanic cell
5.9 Explain the electrode potentials and standard electrode potentials
5.10 Explain the electrochemical series and its significance
5.11 Explain the emf of a cell and solve the numerical problems on emf of the cell based on standard electrode potentials.

6.0 Corrosion

6.1 Define the term corrosion.
6.2 state the Factors influencing the rate of corrosion
6.3 Describe the formation of a) composition cell b) stress cell c)concentration cell during corrosion.
6.4 Define rusting of iron and explain the mechanism of rusting of iron.
6.5 Explain the methods of prevention of corrosion
a)Protective coatings (anodic and cathodic coatings)
b) Cathodic protection (Sacrificial anode process and Impressed–voltage process)

7. 0 Water Treatment

7.1 Define soft water and hard water with respect to soap action.
7.2 Define and classify the hardness of water.
7.3 List out the salts that causing hardness of water (with Formulae)
7.4 State the disadvantages of using hard water in industries.
7.5 Define Degree of hardness and units of hardness (mg/L) or(ppm).
7.6 Explain the methods of softening of hard water: a) Ion-exchange process, b)Permutit process or zeolite process
7.7 State the essential qualities of drinking water.
7.8 Chemistry involved in treatment of water (Coagulation, Chlorination, deflouridation)
7.9 Explain Osmosis and Reverse Osmosis with examples.
7.10 State the applications of Reverse Osmosis.

8.0 Polymers

8.1 Explain the concept of polymerisation
8.2 Describe the methods of polymerization a)addition polymerization of ethylene
b)condensation polymerization of Bakalite(Only flow chart)
8.3 Define thermoplastics and thermosetting plastics with examples.
8.4 Distinguish between thermo plastics and thermosetting plastics
8.5 List the Characteristics of plastics and state the disadvantages of using plastics.
8.6 State the advantages of plastics over traditional materials.

8.7 Explain the methods of preparation and uses of the following plastics:
1. PVC, 2.Teflon, 3. Polystyrene 4. Nylon 6,6

8.8 Explain processing of Natural rubber and write the structural formula of Natural rubber.

8.9 List the Characteristics of raw rubber

8.10 Define and explain Vulcanization and List out the Characteristics of Vulcanized rubber.

8.11 Define the term Elastomer and describe the preparation and uses of the following synthetic rubbers a) Buna-s and b)Neoprene rubber.

9.0 Fuels

9.1 Define the term fuel

9.2 Classify the fuels based on physical state and based on occurrence.

9.3 List the characteristics of good fuel.

9.4 State the composition and uses of gaseous fuels.
a)water gas b) producer gas, c) natural gas, d) Coal gas, e)Biogas.

10.0 Chemistry in daily life

10.1 Give the basic chemical composition, applications, health aspects and pollution impacts of
a) soaps, and detergents b) vinegar c) Insect repellents d) activated charcoal e) Soft drinks

11.0 ENVIRONMENTALSTUDIES

11.1 Define the term environment and explain the scope and importance of environmentalstudies

11.2 Define the segments of environment 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4)Biosphere,

11.3 Define the following terms 1)Pollutant, 2).Pollution, 3).Contaminant, 4)receptor, 5)sink, 6) particulates, 7)dissolved oxygen (DO), 8)Threshold limit value (TLV), 9).BOD,10).COD 11) eco system12) Producers13) Consumers 14) Decomposers with examples

11.4 State the renewable and non-renewable energy sources with examples.

11.5 Explain biodiversity and threats to biodiversity

11.6 Define air pollution and classify the air pollutants-based on origin and physical state of matter.

11.7 Explain the causes, effects of air pollution on human beings, plants and animals and control methods of air pollution.

11.8 State the uses of forest resources.

11.9 Explain causes and effects of deforestation

11.10 Explain the causes and effects of the following
1) Greenhouse effect, 2) Ozone layer depletion and 3) Acid rain

11.11 Define Water pollution, explain the causes, effects and control methods of Water pollution.

COURSE CONTENT
ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

1. **Fundamentals of Chemistry**

   Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers –Aufbau principle - Hund's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

   Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples–Properties of Ionic and Covalent compounds- structures of ionic crystals (NaCl and CsCl).

2. **Solutions**

   Introduction of concentration methods – mole concept, molarity and normality – Numerical problems on mole, molarity and normality.

3. **Acids and Bases**

   Introduction – Theories of acids and bases and limitations – Arrhenius theory- Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water- pH related numerical problems–Buffer solutions, action of buffer and its applications.

4. **Principles of Metallurgy**

   Characteristics of Metals and non-metals –Distinguish between Metals and Non-metals, Define the terms i) Metallurgy ii) ore iii) Gangue iv) flux v) Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of brass, German silver and nichrome.

5. **Electrochemistry**

   Conductors, semiconductors, insulators, electrolytes and non-electrolytes – electrolysis – Faraday's laws of electrolysis-application of electrolysis(electroplating) -numerical problems on Faraday's laws – Galvanic cell – standard electrode potential – electrochemical series–emf and numerical problems on emf of a cell .

6. **Corrosion**

   Introduction - factors influencing corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection methods.

7. **Water technology**

   Introduction–soft and hard water–causes of hardness–types of hardness –disadvantages of hard water – degree of hardness (ppm and mg/lit) – softening methods – permutit process – ion exchange process– qualities of drinking water –Chemistry involved in treatment of water (Coagulation, Chlorination, defluoridation) - Osmosis, Reverse Osmosis –Applications of Reverse osmosis.

8. **Polymers**

   Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials- Disadvantages of using plastics – Preparation and uses of the following plastics i).PVC ii) Teflon iii) Polystyrene iv) .Nylonn 6,6 –Processing of natural rubber - Vulcanization – Elastomers- Preparation and applications of Buna-s, Neoprene rubbers.

9. **Fuels**

   Definition and classification of fuels–characteristics of good fuel-composition and uses of gaseous fuels.

10. **Chemistry in daily life**

    Basic composition, applications, health aspects and pollution impacts of soaps and detergents, vinegar, insect repellents, soft drinks, activated charcoal.

11. **ENVIRONMENTALSTUDIES**

Introduction– environment –scope and importance of environmental studies – important terms related to environment– renewable and non-renewable energy sources–Concept of ecosystem – Biotic components –Forest resources – Deforestation -Biodiversity and its threats-Air pollution – causes-effects–Global environmental issues – control measures – Water pollution – causes – effects – control measures.

REFERENCEBOOKS

1. Telugu Academy — Intermediate chemistry Vol 1&2
2. Jain & Jain — Engineering Chemistry
3. O.P. Agarwal, — Hi- Tech. Engineering Chemistry
4. Sharma — Engineering Chemistry
5. A.K. De — Engineering Chemistry

Table specifying the scope of syllabus to be covered for unit test 1, unit test 2 and unit test 3

Unit Test	**Learning outcomes to be covered**
Unit Test - 1	From 1.1 to 3.7
Unit Test - 2	From 4.1 to 7.10
Unit Test - 3	From 8.1 to 11.11

Model question paper for Unit Test with Cos mapped

UNIT TEST –I

Model Question Paper (C-20)

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (EE-104)

TIME: 90 minutes Total Marks: 40

PART-A **16 Marks**

Instructions: (1) Answer all questions.

(2) First question carries 4 marks and each of rest carries 3 marks.

(3) Answers for Q.No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1. a. Number of neutrons in $_{11}Na^{23}$ is ---------- **(CO1)**

   b. The molarity and normality of HCl is the same (True or False) **(CO1)**

   c. What is the p^H range of base? **(CO1)**

   d. Graphite is a good conductor of electricity (Yes or No) **(CO1)**

2. Distinguish between orbit and orbital. **(CO1)**

3. Define Covalent bond. Explain the formation of covalent bond in Oxygen and Nitrogen molecules. **(CO1)**

4. Define mole. Calculate the number of moles present in 50 gm of $CaCO_3$ and 9.8 gm of H_2SO_4. **(CO1)**

5. Define P^H. Calculate the P^H of 0.001M HCl and 0.01M NaOH solution. **(CO1)**

PART – B **3x8M = 24M**

Answer either (A) or (B) from each questions from Part-B. Each question carries 8 marks.

6. A) Explain Postulations of Bhor's atomic theory. Give its limitations. **(CO1)**

   (OR)

   B) Explain the significance of Quantum numbers. **(CO1)**

7. A) Express molarity normality with mathematical equation. Calculate the molarity and normality of 10gm of NaOH present in 500 ml solution. **(CO1)**

   (OR)

   B) Classify solutions based the physical state of solute and solvent and give an example each. **(CO1)**

8. A) What is buffer solution? Classify with examples and give it`s applications. **(CO1)**

   (OR)

   B) Explain Bronsted-Lowry theory of acids and bases. Give its limitations. **(CO1)**

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UNIT TEST –II
Model Question Paper (C-20)
ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (104)

TIME: 90 minutes Total Marks:40Marks

PART-A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and each of rest carries 3 marks.
(3) Answers for Q.No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1. a) Bauxite is the ore of ..... metal **(CO2)**
   b) What is the unit of electrochemical equivalent? **(CO2)**
   c) $CaSO_4$ is the permanent hardness causing salt. (True or False) **(CO3)**
   d) Write the Chemical formula of rust. **(CO2)**
2. Write any three differences between metallic conduction and electrolytic conduction**.(CO2)**
3. Write the composition and applications of German silver and Nichrome. **(CO1)**
4. Mention any three disadvantages of using hard water in industries. **(CO3)**
5. Define electro chemical equivalent and chemical equivalent. Give the relation between them. **(CO2)**

PART – B **3x8M = 24M**

Answer either (A) or (B) from each questions from Part-B.Each question carries 8 marks.

6. A) What is galvanic cell? Explain construction and working of galvanic cell with neat diagram **(CO2)**

   (OR)

   B) State and explain Faraday`s laws of electrolysis. **(CO2)**

7. A) Explain different types of galvanic cells formed during the corrosion of metals.**(CO2)**

   (OR)

   B) What is hard water? Explain zeolite process of softening of hard water. **(CO3)**

8. A) Explain Froth floatation process. **(CO1)**

   (OR)

   B) Explain Electrolytic refining processing of copper. **(CO1)**

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UNIT TEST –III
Model Question Paper (C-20)
ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (EE-104)

TIME: 90 minutes Total Marks:40

PART-A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and each of rest carries 3 marks.
(3) Answers for Q. No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1. a) The monomer of PVC..... **(CO4)**
   b) Sulphur is the vulcanising agent. (True/False) **(CO4)**
   c) Give an example for secondary pollutant. **(CO5)**
   d) Presence of ozone in stratosphere is a pollutant.(Yes/No) **(CO5)**
2. List any three characteristic properties of vulcanised rubber. **(CO4)**
3. Define primary fuel and secondary fuels give an example each. **(CO4)**
4. Mention the basic chemical composition and applications of vinegar. **(CO4)**
5. Write any three threats to the biodiversity. **(CO5)**

PART – B **3x8M = 24M**

Answer either (A) or (B) from each questions from Part-B.Each question carries 8 marks.

6. A) Explain addition and condensation polymerisation with an example each. **(CO4)**

   (OR)

   B) Give a method of preparation and applications of the following
   i) Buna-S ii) Neoprene **(CO4)**
7. A) What is air pollution? Explain any three causes of air pollution. **(CO5)**

   (OR)

   B) Briefly explain ozone layer depletion and green house effect. **(CO5)**
8. A) What is water pollution? Explain any three controlling methods of water pollution.**(CO5)**

   (OR)

   B) What are thermoplastics and thermo setting plastic? Write any four differences between these two plastics. **(CO4)**

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Model Question Paper (C-20)

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (104)

TIME: 3hrs Total Marks:80

PART-A

Instructions: (1) Answer all questions. 3x10=30M
(2) Each question carries 3 marks.

1. Draw the shapes of s and p orbitals. **(CO1)**
2. Define mole. Find the mole number of 10 g of $CaCO_3$ **(CO1)**
3. Define Buffer solution. Give any two examples. **(CO1)**
4. Define chemical equivalent and electrochemical equivalent. Give their relation. **(CO2)**
5. State name of the salts and their formulae that cause hardness. **(CO3)**
6. Write any three disadvantages of using plastics. **(CO4)**
7. Classify the fuels based on their occurrence. **(CO4)**
8. Mention the basic chemical composition and applications of vinegar. **(CO4)**
9. List out any three threats to biodiversity. **(CO5)**
10. Define pollutant and contaminant. Give an example each. **(CO5)**

PART – B

Each question carries eight marks. 8x5=40M

11. A) Explain Bhor's atomic theory and give its limitations. **(CO1)**
    (OR)
    B) Explain ionic bond formation and covalent bond formation with one example each **(CO1)**
12. A) Calculate the molarity and normality of 250 ml of sodium carbonate solution that contains 10.6 gm of sodium carbonate. **(CO1)**
    (OR)
    B) Explain Bronstead and Lowry theory of acids and bases. Give its limitations. **(CO1)**
13. A) Explain froth floatation and electrolytic refining of copper with neat diagrams. **(CO1)**
    (OR)
    B) Explain the construction and working of galvanic cell. **(CO2)**
14. A) Explain Cathode protection methods. **(CO2)**
    (OR)
    B) Explain ion-exchange of softening of hard water with a neat diagram. **(CO3)**
15. A) Explain addition and condensation polymerisation with an example each. **(CO4)**
    (OR)
    B) Explain the causes and effects of air pollution. **(CO5)**

PART –C

Question carries Ten marks 10x1 =10M

16. Analyse the products formed at cathode and anode with electrode reactions during the Electrolysis of aqueous NaCl in compare with fused NaCl. **(CO2)**

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SCHEME C20
ELECTRICAL ENGINEERING MATERIALS

Coursecode	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-105	ELECTRICAL ENGINEERING MATERIALS	03	90	20	80

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Conducting Materials	18	CO1
2	Semiconducting Materials	09	CO2
3	Insulating Materials	15	CO2
4	Di- electric Materials	9	CO3
5	Magnetic Materials	10	CO3
6	Special Purpose Materials	11	CO4
7	Batteries	18	CO5
	TOTAL	**90**	

Course objectives	1) To familiarise with the knowledge of different electrical engineeringmaterials. 2) To know about the different special purpose materials. 3) To understand different aspects regardingbatteries.

Course outcomes	CO1	EE-105.1	Explain the properties of different conducting materials and their applications
	CO2	EE-105.2	Analyze semiconductors and Insulating materials
	CO3	EE-105.3	Describe Magnetic materials and dielectric materials and their properties
	CO4	EE-105.4	Distinguish the working function of Special purpose materials
	CO5	EE-105.5	Explainthe working of Various Batteries

LEARNING OUTCOMES

ConductingMaterials

1.1 Define ConductingMaterials
1.2 State the properties of conductingmaterials
1.3 Define the terms (i) Hardening (ii)Annealing

1.4 Explain the effects of Hardening and Annealing on copper with regard to Electrical and Mechanicalproperties

1.5 State the main requirements of Low ResistivityMaterials

1.6 List some examples of i)Low Resistivity Materials ii)High Resistivitymaterials

1.7 Mention the Properties & Applications of Copper andAluminium

1.8 Distinguish between Copper andAluminum

1.9 Mention the properties & applications of ACSR Conductors andAAAC.

1.10 State the requirements of High ResistiveMaterials

1.11 State the types of High ResistiveMaterials

1.12 List the properties & Applications of High ResistiveMaterials
(i) Manganin (ii)Eureka (iii) Constantan (iv)Nichrome(v) Tungsten (vi)Mercury(vii) Carbon

SemiconductingMaterials

2.1 Define Semiconductingmaterials.

2.2 Classify Semiconductingmaterials.

2.3 Define (i)IntrinsicSemiconductors and(ii)ExtrinsicSemiconductors.

2.4 Distinguish between Intrinsic and Extrinsicsemiconductors.

2.5 Explain the formationof
(i) P – typesemiconductorand(ii)N - typesemiconductor

2.6 Distinguish between P and N typeSemiconductors

InsulatingMaterials

3.1 Define InsulatingMaterials.

3.2 Draw energy level diagrams of conductors, insulators andsemi-Conductors.

3.3 Distinguish between Conductors, Insulators andSemiconductors

3.4 State the important electrical properties of Insulatingmaterials
(i) Insulation resistance(ii)Volume(iii)Surface resistance

3.5 Explain factors affecting insulationresistance

3.6 Classify Insulating materials on the basis oftemperature i.e., (Y, A, E, B, F, H and Class)

3.7 Classify insulatingmaterials

3.8 State the properties and applications of (i) Impregnated paper(ii) Wood (iii)Asbestos (iv)Mica(v)Ceramics(vi)Glass.

3.9 Explain Thermoplastic & Thermosetting resins withexamples

3.10 Explain the properties and applications ofPVC

3.11 State the effects of the following onP.V.C.
(i) Filler (ii)Stabilizer(iii)Plasticizer (iv)Additives.

3.12 State the Properties and applications of the followinggases
(i)Hydrogen (ii) Sulphur – Hexafluoride(SF_6)

Di-Electricmaterials

4.1 Know the Permittivity of commonly used di - electricmaterials
(i) Air (ii)Bakelite (iii)Glass (iv)Mica(v)Paper (vi)Porcelain (vii)Transformeroil

4.2 ExplainPolarization

4.3 Explain Di-electricLoss

4.4 List any four applications ofDi-electrics

MagneticMaterials

5.1 Classify the Magnetic Materialas
(i)Ferro (ii) Para (iii) Dia-Magnetic materials withexamples
5.2 Explain (i)SoftMagneticmaterials (ii) Hard Magneticmaterials
5.3 Draw (i)B-H.Curve (ii)Hysteresis loop
5.4 Explain Hysteresisloop
5.5 Explain Hysteresis loss and State Steinmetz equation(No-Problems)
5.6 Explain Eddy CurrentLosses
5.7 State Curie point
5.8 DefineMagnetostriction

Special PurposeMaterials

6.1 State the need for protectivematerials
6.2 List the various protective materials like Lead, Paints, Steel Tapesetc.
6.3 Explain the thermo couplematerials
6.4 State theBi-metals
6.5 State the solderingmaterials
6.6 Define fuse
6.7 State the different types of materials used forfuse
6.8 Explain the process of Galvanizing andImpregnation
6.9 State the use of enamel coated copper wires (Thin, Medium and Thick)

Batteries

7.1 Classify cells as Primary and Secondarycells and distinguish between them
7.2 Explain BackEMF and how it is determined
7.3 Give the formulae for output voltage and current when cells are connected in
(i) Seriesand (ii) Parallel to form battery
7.4 Explain the significance of Internal resistance of abattery
7.5 Classify storage cells as Lead-Acid, Nickel-Iron and Nickel- Cadmiumtype
7.6 Explain the constructional details of Lead-Acidbattery with chemical reactions during charging and discharging.
7.7 List indications of fully charged Lead-Acidbattery
7.8 List the precautions to be observed while maintaining Lead acidbatteries
7.9 State applicationsof
(i) Lead-Acidbattery(ii) Nickel-Iron cell (iii) Nickel-Cadmiumbattery
7.10 Explain charging of batteriesby
(i) ConstantCurrentmethodand (ii) Constant Voltagemethod
7.11 State precautions to be taken during charging & discharging ofbatteries
7.12 Define Tricklecharging
7.13 State capacity of a battery and factors affectingcapacity
7.14 State Ampere- hour efficiency and Watt- Hour efficiency ofbattery and solve the problems
7.15 Explain the construction and working of maintenance freebattery and state its applications
7.16 Differentiate between maintenance free batteries and Lead-Acidbatteries

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-105.1	3	1						3		1
EE-105.2	3	1						3		
EE-105.3	3	2						3		
EE-105.4	3	3		3	3			3	2	2
EE-105.5	3	2	3					3	2	2
Average	**3**	**1.8**	**3**	**3**	**3**			**3**	**2**	**1.7**

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

1. **Conducting Materials:**
   Conducting Materials – Properties -Hardening, Annealing – Its effects- Low Resistive Materials – Requirements – Properties and applications of Copper and Aluminum - Comparison between Copper and Aluminum - ACSR Conductors, AAAC, - High Resistive Materials – Requirements- Properties and applications of Manganin, Eureka, Constantan, Nichrome, Tungsten, Mercury and Carbon.

2. **SemiconductingMaterials**
   Semiconductors - Intrinsic and Extrinsic semiconductors- `P' and `N' type materials- Distinguish between P-type and N- type Semi Conductors.

3. **InsulatingMaterials**
   Properties -Insulation resistance - Factors effecting Insulation resistance - Classification of Insulating materials - Properties & Applications of Impregnated Paper, Wood, Asbestos, Mica, Ceramic, Glass- Thermo Plastics, Thermo Setting resins – PVC- Effects on PVC- Properties and Applications of Insulating Gases(Hydrogen and Sulphur HexaFluoride).

4. **Di- electricmaterials**
   Permittivity of different Di - electric materials- Polarization - Dielectric Loss – Applications of Dielectrics.

5. **Magnetic Materials**
   Classification of magnetic materials - Soft & Hard magnetic materials- B-H Curves - Hysteresis loop - Hysteresis loss - Steinmetz constant - Eddy Current Loss -- Curie Point – Magnetostriction.

6. Special PurposeMaterials

Need of Protective materials – List of Special Purpose Materials (Lead, Paints, Steel Tapes) - Thermocouple - Bi-metals- Soldering- Fuses -Galvanizing and Impregnating.

7. Batteries

Primary cell and Secondary cells-Lead-Acid,-Chemical reactions during charging and discharging – Charging of Batteries- Constant Current method and Constant Voltage method-Trickle charging - Capacity of Battery - Ampere-Hour efficiency and Watt-Hour efficiency - Maintenance free batteries.

REFERENCE BOOKS

1 Dr.K.Padmanabham-Electronic Components -Laxmi publications(P) Ltd.
2 Electronic Components-D.V.Prasad-Radiant publishers
3 Electrical Engineering Materials – N.I T.T.T.RPublications
4 B.K.Agarwal-Introduction to Engineering materials –Tata McGraw-Hill publishers
5 Material science for Electrical and Electronic Engineers –Ian P.Jones (Oxford Publications)

Blue print:

S.No.	Unit title	No. of period s	Weightage allocated		Markswise distribution of weightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1.	Conducting Materials	18	18	*	3	3	8	*	1	1	1	*	**CO1**
2.	Semiconductin g Materials	09	8		0	0	8		0	0	1		**CO1,CO2**
3.	Insulating Materials	15	11	*	3	0	8	*	1	0	1	*	**CO1,CO2**
4.	Di- electric Materials	9	6		3	3	0		1	1	0		**CO1,CO3**
5.	Magnetic Materials	10	6		3	3	0		1	1	0		**CO1, CO3**
6.	**Special purpose materials**	11	11		0	3	8		0	1	1		**C01, CO4**
7.	**Batteries**	18	14	*	3	3	8	*	1	1	1	*	**CO1, CO5**
Total		**90**	**70**	**10***	**15**	**15**	**40**	**10**	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Syllabus to be covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test - I	From 1.1 to 3.3
Unit Test - II	From 3.4 to 5.8
Unit Test - III	From 6.1 to 7.16

C-20-EE-105

MODEL PAPER – FORMATIVE ASSESMENT-1

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIRST YEAR EXAMINATION

EE-105 : ELECTRICAL ENGINEERING MATERIALS

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

1) Answer all **five** questions.
2) First question carries **four** marks and remaining each question carries **three** marks.
3) Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Nichrome is an alloy of _____.

   (b) Silicon and Germanium materials are _____ type semiconductors.

   (c) Paper is a conducting material: True / False.

   (d) Tungsten is high resistance material: True / False. (CO1, Co2,CO3)

2. Define the terms Hardening and Annealing. (CO1)

3. Distinguish between Intrinsic and Extrinsic Semiconductors in Three aspects. (CO2)

4. Draw the Energy level diagrams of conductors, Insulator and Semiconductors. (CO2)

5. State the properties of mercury. (CO1)

PART-B **3 X 8 = 24**

Instructions:

1) Answer all three questions.
2) Each question carries eight marks.
3) The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) State the properties of Low resistive materials. (CO1)

   (or)

   (b) State the properties of High resistive materials. (CO1)

7. (a) Explain the formation of P- Type Semiconductor. (CO2)

   (or)

   (b) Distinguish between P-Type and N-Type Semiconductors. (CO2)

8. (a) State the applications of (a) ACSR (b) Manganin. (CO1)

   (or)

   (b) Distinguish between Copper and Aluminium. (CO1)

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C-20-EE-105

MODEL PAPER – FORMATIVE ASSESMENT-2

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIRST YEAR EXAMINATION

EE-105 : ELECTRICAL ENGINEERING MATERIALS

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

1) Answer all **five** questions.
2) First question carries **four** marks and remaining each question carries **three** marks.
3) Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Permittivity Value of Mica _____.

   (b) The temperature at which the magnetic material losses it magnetic property is called _____

   (c) Transformer oil is used as Insulating medium and Coolant in Transformers : **True / False.**

   (d) Static Condensers are Used to improve the Power factor. **True / False.** **(CO2, CO3)**

2. State the any four applications of PVC. **(CO2)**

3. Define Magnetostriction in magnetic materials . **(CO2)**

4. State magnetic materials with examples. **(CO3)**

5. Distinguish Insulating materials and dielectric materials in three aspects. **(CO3)**

PART-B **3 X 8 = 24**

Instructions:

1) Answer all three questions.
2) Each question carries eight marks.
3) The answers should be comprehensive and the criteria for valuation are the
4) Content but not the length of the answer.

6. (a) State the properties of SF_6 gas. **(CO2)**

   (or)

   (b) Explain Thermo-Plastic & Thermo Setting resins with examples. **(CO2)**

7. (a) Explain the phenomenon Polarization in Di-Electric materials. **(CO2)**

   (or)

   (b) State the applications of Di-electric materials . **(CO2)**

8. (a) Explain B-H curve. **(CO3)**

   (or)

   (b) Distinguish Hard and Soft magnetic materials . **(CO3)**

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MODEL PAPER – FORMATIVE ASSESMENT-3

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIRST YEAR EXAMINATION

EE-105 : ELECTRICAL ENGINEERING MATERIALS

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all **five** questions.

ii. First question carries **four** marks and remaining each question carries **three** marks.

iii. Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. (a) Specific Gravity of Electrolyte used in Lead-Acid cell _____.

   (b) The temperature at which the magnetic material losses it magnetic property is called _____

   (c) Transformer oil is used as Insulating medium and Coolant in Transformers : **True / False.**

   (d) Static Condensers are Used to improve the Power factor. **True / False.** **(CO4, CO5)**

2. State the different types of Fuse materials. **(CO4)**

3. State the uses of Enamel Coated Copper wires . **(CO4)**

4. Define Ampere-Hour Efficiency and Watt-Hour efficiency. **(CO5)**

5. Distinguish primary cells and secondary cells . **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.

ii. Each question carries eight marks.

iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain the working of thermo Couple with diagram. **(CO4)**

   (or)

   (b) Explain the process of Galvanisation and Impregnation. **(CO4)**

7. (a) Explain the Construction of Lead-Acid battery. **(CO5)**

   (or)

   (b) State the precautions to be observed while maintaining Lead –Acid battery. **(CO5)**

8. (a) Explain the working of Maintenance free battery . **(CO5)**

   (or)

   (b) List the Indications of Fully Charged Lead-acid battery. **(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-105
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIRST YEAR EXAMINATION
EE-105 : ELECTRICAL ENGINEERING MATERIALS

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

1) Answer all questions.
2) Each question carries three marks.
3) Answers should be brief and straight to the point and shall not exceed five simple sentences

1. Define the terms (a) Hardening (b) Annealing **(CO1)**

2. State any three applications of ACSR Conductors**.** **(CO1)**

3. State the properties of SF_6 gas. **(CO2)**

4. Define Polarisation in Dielectric Materials. **(CO3)**

5. List any three applications of Dielectrics. **(CO3)**

6. Define Magnetostriction in magnetic materials. **(CO3)**

7. Classify the magnetic materials. **(CO3)**

8. State the need of Protective materials. **(CO4)**

9. State the use of Enamelled coated copper wires. **(CO4)**

10. State the precautions to be taken during charging of Batteries. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

1) Answer all five questions.
2) Each question carries eight marks.
3) The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. (a) Distinguish between Copper and Aluminium. **(CO1)**

(or)

(b) Explain the properties of High Resistance materials. **(CO1)**

12. (a) Explain the formation of P-type semiconductors. **(CO2)**

(or)

(b) Distinguish between N-type and P-Type Semiconductors . **(CO2)**

13. (a) Classify the Insulating materials on the basis of working Temperature. **(CO2)**

(or)

(b) Explain the properties of PVC and state its applications. **(CO2)**

14. (a) Explain the working of Thermo Couple with sketch. **(CO4)**

(or)

(b) Explain the process of Galvanisation. **(CO4)**

15. (a) Explain the construction details of Lead- Acid Battery. **(CO5)**

(or)

(b) Differentiate between maintenance free Battery and Lead-Acid battery. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

1) This question carries ten marks.

2) The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

16. Compare the properties of solid, liquid and gaseous insulating materials. **(CO2)**

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SCHEME C20

BASIC ELECTRICAL ENGINEERING

Coursecode	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-106	BASIC ELECTRICAL ENGINEERING	05	150	20	80

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Basic Principles of Electricity	30	CO1
2	Work, Power and Energy	15	CO2
3	Heating effects of electric Current	20	CO3
4	Magnetic effects of Electric current	30	CO4
5	Electromagnetic Induction	35	CO4
6	Electrostatics and Capacitance	20	CO5
TOTAL		**150**	

Course Objectives	i. To understand the basic principles of Electricity and analysing resistivenetworks ii. To comprehend the different effects of electriccurrent iii. To know the concept of electro-magnetic induction and electrostaticfield.

Course outcomes	**CO1**	EE-106.1	Explain various laws and resistive circuits.
	CO2	EE-106.2	Practice of electricity bill of domestic consumers
	CO3	EE-106.3	Explain the heating effects of Electric current and analysing CFL& LED lamps
	CO4	EE-106.4	Analyse different terms related to magnetic field and electro magnetic induction
	CO5	EE-106.5	Analyse principles of electrostatics

LEARNING OUTCOMES

Basic Principles ofElectricity

1.1 List merits of Electrical Energy over other types ofenergy
1.2 Define Electric Current, Potential difference, Voltage andEMF
1.3 Distinguish between DC and ACquantities
1.4 StateOhm'sLaw and solve problems
1.5 List the limitations of OhmsLaw
1.6 Define the termsi)Specific resistanceii)Conductance iii)Conductivity
1.7 Derive the relation R =(ρ l) /aand solve the problems

1.8 Explain the effects of temperature onresistance
1.9 Develop the expression for resistance at any temperature as $R_t = R_o (1+\alpha_o t)$
1.10 Define temperature Co-efficient of resistance and give itsunit

1.11 Develop the formula for Co-efficient of resistance at any temperatureas

$\alpha_t = \alpha_o / (1+\alpha_o t)$

1.12 Solveproblemsbasedontheformulae$R_t=R_o(1+\alpha_o t)$ &$\alpha_t=\alpha_o/(1+\alpha_o t)$
1.13 Develop the expressions for equivalent Resistance with simple SERIESand PARALLEL connections
1.14 Solve problems on equivalent resistance in case of Series- Parallelnetworks
1.15 State the concept of division of current when two Resistors are connected inparallel and solve the problems

Work, Power &Energy

2.1 Define Electric Work, Power andEnergy
2.2 State the formula for Electric Work, Power and Energy and mention S.I. System of units for Work, Power andEnergy
2.3 Solve problems on Work, Power and Energy in Electrical, Mechanical and Thermalunits
2.4 Mention the typical power ratings of home appliances like Electric lamps(Incandescent, fluorescent, CFL & LED), Water heater, Electric Iron, Fans, Refrigerators, Air and Water coolers, Television sets, Air Conditioners, Water Pumps, Computers, Printersetc.
2.5 Calculate Electricity bill of domestic consumers as per the ElectricityTariff

Heating effects of ElectricCurrent

3.1 State the heat produced due to flow ofcurrent
3.2 Derive the expression for conversion of Electrical Energy into equivalent Heatenergy in kilo calories (Joule'slaw)
3.3 Define Thermalefficiency
3.4 Solve problems on Electricheating
3.5 Explain the applications of heat produced due to Electric currentin
(i) Metal Filament lamp (ii)Electrickettle(iii) Electric Cooker (iv) ElectricIron(v) Geyser
3.6 Mention the merits and demerits ofCFL
3.7 Mention the merits and demerits of LEDlamp

Magnetic effects of ElectricCurrent

4.1 State Coulombs laws ofMagnetism
4.2 Define the terms Absolute and Relative Permeability ofmedium and give relation between them
4.3 Explain the concept of lines of force & magneticfield
4.4 State Right hand Thumbrule
4.5 Draw and explain the field patterns dueto
(i) Straight currentcarryingconductor (ii) Solenoid (iii) Toroid
4.6 State and list the applications of (i) Work law (ii) Biot-Savart'sLaw(Laplacelaw)
4.7 Explain the Mechanical force on a current carrying Conductor placed inside a Magneticfield.
4.8 Derive an expression for the magnitude of the force on a current carrying conductor inside a magneticfield.

4.9 StateFleming'sLeftHandrule
4.10 Derive an expression for the force between two parallel current carrying conductors and solve problems
4.11 State the nature of force with different directions of thecurrents
4.12 Understand the concept of the Magneticcircuit and Define the terms MMF, Flux and Reluctance
4.13 Compare Magnetic circuit with Electric circuit in differentaspects
4.14 Explain the effect of air gap in a magneticcircuit
4.15 Explain the terms leakage flux and leakageco-efficient

Electro MagneticInduction

5.1 StateFaraday'slawsofElectro-MagneticInduction
5.2 Explain Dynamically and Statically inducedE.M.Fs.
5.3 State Lenz'slaw
5.4 ExplainFleming'sRightHandrule
5.5 Explain the concept of Self and Mutualinductance
5.6 Derive an expression for Self and Mutualinductance
5.7 State Co-efficient ofcoupling
5.8 Explain the total inductance in series connections with reference to direction offlux (Series Aiding and Series Opposition)
5.9 Develop an expression for the energy stored in a magneticfield and solve problems
5.10 Develop an expression for the energy stored per unit volume in a magneticfield
5.11 Develop an expression for lifting power of amagnet and solve problems

Electrostatics andCapacitance

6.1 StateCoulomb'slawsofElectrostaticsandsolve the problems
6.2 Define the following terms
(i) Unit Charge(ii) Absolute permittivity (iii) Relativepermittivity (iv) Electric Flux
(v) Flux Density (vi) Field intensity
6.3 Explain Electrostaticfield and Plot electrostatic Field dueto
I) Isolated positivecharge
Ii) Isolated negativecharge
Iii) Unlike charges placed side byside
Iv) Like charges placed side byside
6.4 Compare Electrostatic and Magnetic circuits in differentaspects.
6.5 State Gausstheorem
6.6 Definethe concept of electric potential and potentialdifference
6.7 Define Di-electric strength and Di-electricconstant
6.8 Give the permittivity of commonly used Di-electricmaterials
6.9 Define Capacitance and state factors affecting the capacitance of acapacitor
6.10 Derive the formula for capacitance of a parallel platecapacitor
6.11 State different types ofcapacitors with its uses
6.12 Derive an expression for equivalent capacitance
I) When two Capacitors connected inseries;
Ii) When two Capacitors connected inparallel
6.13 Derive an expression for the Energy stored in acapacitor and solve problems

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-106.1	3	3		3				3		
EE-106.2	3	3				1		3		
EE-106.3	3					1	1	3	2	1
EE-106.4	3		3		1			3		
EE-106.5	3		3	2	1			3		
Average	**3**	**3**	**3**	**2.5**	**1**	**1**	**1**	**3**	**2**	**1**

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Basic Principles ofElectricity
Conductor,Insulator,Semiconductor-ElectricPotential–Ohm'slaw–Resistance– Specific Resistance – Conductivity – Temperature coefficient of Resistance – Resistance in series, parallel and series - parallelcombinations.

Work, Power &Energy
Units of Work, Power and Energy.– Ratings of different Domestic Appliances- Conversion of Units–Efficiency- Electricity bill of Domestic Consumer.

Heating Effects of ElectricalCurrent
Mechanical Equivalent of Heat - Heat produced due to flow of Current in Metal Filament lamps, Electrical Kettle, Electric Cooker, Electric Iron, Geyser- Merits and Demerits of CFL and LED lamps.

Magnetic Effects of ElectricCurrent
Coulombs laws- Permeability - Lines of force –Right hand Thumb rule - Field pattern due to long straight current carrying conductor-Field patternofsolenoidandToroid-WorkLawanditsapplications–Biot-Savart'sLaw (Laplace Law)- Mechanical force on a currentcarryingconductor placed inside a magnetic field - Direction of force - Fleming's Left Hand rule-Force between two parallel current carrying conductors –Solve problems - Magnetic circuit-Magnetizing force – Permeability - Flux - Reluctance - Comparison of Magnetic circuit With Electric circuit - Magnetic leakage flux and leakageCo-efficient.

Electro MagneticInduction
Faraday'slaws-DynamicallyandStaticallyinducedE.M.F-Lenz'sLaw&Fleming'sRight Hand rule -Self and Mutual inductance - Co-efficient of coupling - Inductances in series - Energy stored in a magnetic field - Energy stored per unit volume - Lifting power ofmagnet-problems

Electrostatics andCapacitance
Coulomb'sLawsofElectrostatics–-Permittivity-Electrostaticinduction-Electrostatic field - Lines of force -Comparison of Electrostatic and Magnetic lines of force - Strength of electric field- Flux density -Gauss theorem - Concept of Electric potentialandPotential difference –Di-electric strength – Di-electric constant - Capacitance – Charging and Discharging of Capacitor- Factors

affecting the Capacitance of Capacitor–Types of Capacitors- Uses - Capacitors in Series and Parallel- Energy stored in a Capacitor-problems

REFERENCE BOOKS

1. B.L.Theraja -Electrical Technology Vol.I-S.Chand&co.
2. Hughes,JohnHiley-Electrical and electronic Technology-Pearson
3 J.B.Gupta -A course in ElectricalTechnology-KATSON BOOKS
4. G.B.Bharadhwajan& A. SubbaRao -Elements of ElectricalEngineering.
5. D.C.Kulshreshtha.-Basic Electrical Engineering–Tata McGraw-Hill Education

Blue print:

S.No.	Unit title	No. of period	Weightage allocated		Marks wise distribution of weightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1.	Basic Principles of Electricity	30	14		3	8	3		1	1	1		**CO1**
2.	Work, Power and Energy	15	11		3	8	0		1	1	0		**CO2**
3.	Heating effects of electric Current	20	06		3	0	3		1	0	1		**CO1, CO3**
4.	Magnetic effects of Electric current	30	14	*	3	8	3	*	1	1	1	*	**CO1, CO4,CO5**
5.	Electromagnetic Induction	35	14	*	3	8	3	*	1	1	1	*	**CO4, CO5**
6.	Electrostatics and Capacitance	20	11	*	3	8	0	*	1	1	0	*	**CO5**
Total		**150**	70	10*	21	40	9	10*	7	5	3	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Unit Test	Learning Outcomes to be Covered
Unit Test – I	From 1.1 to 2.5
Unit Test – II	From 3.1 to 4.15
Unit Test – III	From 5.1 to 6.13

Model Papers:Syllabus to be Covered for Unit Tests

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-106
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIRST YEAR EXAMINATION
EE-106 : BASIC ELECTRICAL ENGINEERING

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) The unit of electric current is _____.
   (b) The Ohm's law does not obeys for _____.
   (c) The unit of electrical energy is KWh: True / False.
   (d) If two resistances of 5Ω each are connected in parallel with each other, then the equivalent resistance is _____. **(CO1,CO2)**
2. State Ohm's law.
3. Define temperature co-efficient of resistance. **(CO1)**
4. Define work and state its unit **(CO1)**
5. State the typical power ratings of (i) LED lamp (ii) Refrigerator (iii) Television set **(CO2)**
   (iv) Water pump (v) Computer (vi) Water heater. **(CO2)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Derive an expression for equivalent resistance when two resistances are connected in parallel. **(CO1)**

   (or)

   (b) A copper conductor has a resistance of 25Ω at 20 ^{0}C and 28.225Ω at 50 ^{0}C.
   Find the temperature co-efficient of resistance at 0 ^{0}C ad resistance at 0 ^{0}C. **(CO1)**
7. (a) Derive an expression for resistance at any temperature $R_t = R_0(1+\alpha_0 t)$. **(CO1)**

   (or)

   (b) When two resistances of 5 Ω and 20 Ω are connected in parallel across 240V supply.
   Calculate the total current and current through each resistance. **(CO1)**

8. (a) Calculate the monthly bill of domestic service with the following loads for a month of 30 days.

(i) 4 lamps of 100 W each used for 6 hours a day.

(ii) 2000 W immersion heater used for 1 hour a day.

(iii) 3 fans of 60 W each used for 10 hours a day.

(iv) 1000 W electrical iron used for 1 hour a day.

The cost per unit of consumption is 50 paisa. **(CO2)**

(or)

(b) Two lamps of rating 220 V, 40 W and 220 V, 60 W are connected in series across 220 V supply. Calculate (i) voltage across each lamp (ii) power consumption. What will be the power consumption if the two lamps are connected in parallel? **(CO2)**

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UNIT TEST II - MODEL PAPER – FORMATIVE ASSESMENT-2

C-20-EE-106

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIRST YEAR EXAMINATION

EE-106 : BASIC ELECTRICAL ENGINEERING

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) The unit of heat is _____.
   (b) The filament is incandescent lamp is made of _____.
   (c) The unit of charge is coulomb: True / False.
   (d) Write an expression for the force between two parallel current carrying conductors.
2. State any three merits of CFL lamps. **(CO3)**
3. Define Thermal Efficiency. **(CO3)**
4. State Fleming's Left Hand Rule. **(CO4)**
5. Define the terms MMF and Reluctance related to magnetic field. **(CO4)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Explain the operation of Electrickettle with a schematic diagram. **(CO3)**

(or)

(b) An immersion heater marked 4.6 KW, 230 V has to raise the temperature of 45.36 kg of water from 20o C to 95o C in one hour. Find the efficiency of immersion heater. **(CO3)**

7. (a) Derive an expression for the magnitude of the force on a current carrying conductor inside a magneticfield. **(CO4)**

(or)

(b) Explain the effect of air gap in a magneticcircuit. **(CO4)**

8. (a) Two long straight parallel conductors kept in air 2 m apart carry currents of80 A and 30 A in the same direction. Calculate theforce per metre length between them and specify its nature. **(CO4)**

(or)

(b) Compare Magnetic circuit with Electric circuit in differentaspects. **(CO4)**

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UNIT TEST III - MODEL PAPER – FORMATIVE ASSESMENT-3
C-20-EE-106
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIRST YEAR EXAMINATION
EE-106 : BASIC ELECTRICAL ENGINEERING

Time: 90 Minutes Total Marks: 40

PART-A (1 x 4) + (4 x 3) = 16

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) The unit of Inductance is _____.
   (b) Write the formula for energy stored in a magnetic field.
   (c) The unit of Capacitance is Farads. True / False.
   (d) The relative permittivity of air is _____.
2. State Lenz's law. **(CO4)**
3. StateFaraday'slawsofElectro-MagneticInduction. **(CO4)**
4. State the uses of capacitors. **(CO5)**
5. Define the terms Absolute permittivity and Relative permittivity related to magnetic field. **(CO5)**

PART-B 3 X 8 = 24

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Derive the total inductance when two inductances are connected in series aiding. **(CO4)**

   (or)

   (b) If a coil has 500 turns is linked with a flux of 50 mwb, when carrying acurrent of 100 A. Calculate the energy stored in a magnetic field. **(CO4)**

7. (a) StateCoulomb'slawsofElectrostatics. **(CO5)**

   (or)

   (b) Two charges + 20μC and – 5μC are placed in air 10 cm apart. (i) what force exists between them? (ii) If the same charges are separated by same distancein kerosine (εr = 2). What is the corresponding force between them. **(CO5)**

8. (a) Define Capacitance and state factors affecting the capacitance of acapacitor. **(CO5)**

   (or)

   (b) Derive an expression for equivalent capacitance when two capacitances are connected in series. **(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-106
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIRST YEAR EXAMINATION
EE-106 : BASIC ELECTRICAL ENGINEERING

Time: 3 hours Total marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. State Ohm's law. **(CO1)**
2. Determine the resistance of 100m length of a wire having a uniform cross-sectional area of 0.1 mm^2, if the wire is made of manganin having a resistivity of $100x10^{-8}$ Ω–m. **(CO1)**
3. Define electric power and electrical energy and give their SI units. **(CO2)**
4. State Joule's law of heating. **(CO3)**
5. State Fleming's left-hand rule. **(CO4)**
6. List the properties of magnetic lines of force. **(CO4)**
7. Draw the field pattern due to long straight current carrying conductor. **(CO4)**
8. Define self-inductance and mutual inductance. **(CO4)**
9. State Faraday's laws of Electro-Magnetic Induction. **(CO4)**
10. Define electric flux and electric flux density and mention its unit. **(CO5)**

PART-B **5 X 8 = 40**

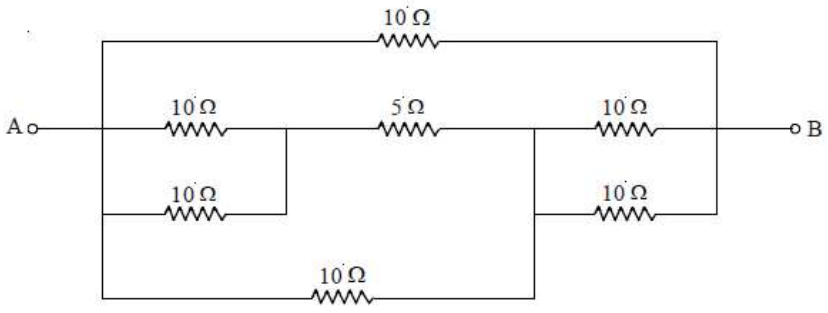
Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) Derive the formula for equivalent resistance of three resistances in
(i) series (ii) parallel. **(CO1)**

(or)

(b) Find the equivalent resistance between the terminals A and B in the given network. **(CO1)**



12.(a) Calculate the bill of electricity charges for the following loads

(i) 10 lamps 60 watt each working 5 hours a day.

(ii) 5 ceiling fans 120 watt each working 10 hours a day.

(iii) 2 KW heater working 4 hours a day.

(iv) 2 H.P. motor with efficiency 80% working 4 hours a day.

Calculate the monthly bill at 50 paisa/unit, if the meter rent per month is Rs. 5/-**(CO2)**

(or)

(b) Two lamps of rating 220 V, 60 W and 220 V, 100 W are connected in series across 220 V supply. Calculate the voltage across each lamp and power consumption. What will be the power consumption if the two lamps are connected in parallel. **(CO2)**

13. (a) Derive an expression for the magnitude of the force on a current carrying conductors in side a magnetic field. **(CO4)**

(or)

(b) Draw the magnetic circuit and explain the parameters: magnetising force, flux, permeability and reluctance. **(CO4)**

14. (a)Derive an expression for total and equivalent inductances when two inductances are connected in series-aiding. **(CO4)**

(or)

(b) Explain dynamically and statically induced EMF. **(CO4)**

15. (a) Compare between electrostatic and magnetic circuits in any eight aspects.**(CO5)**

(or)

(b) Three identical point charges of +5 mC each are placed at the vertices of an equilateral triangle 10 cm apart. Calculate the force on each charge. Assume the medium is air.**(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**
ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. In a capacitor if mica is replaced with paper, explain its behavioural changes. **(CO5)**

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Subject Title	Subject Code	Periods/Week	Periods Per Year
Engineering Drawing	EE–107	06	180

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	No. Of Periods	Marks to be awarded	ShortAnswer Questions	Essay type Questions
1	Importance of Engineering Drawing	--	01	-	-	-
2	Engineering Drawing Instruments	01	05	-	-	-
3	Free hand lettering & Numbering	01	06	05	1	-
4	Dimensioning Practice	01	09	05	1	-
5	Geometrical constructions	03	24	15	1	1
6	Projections of Points, Lines, Planes & Auxiliary Planes	03	21	05	1	
7	Projections of Solids	01	12	10		1
8	Sections of Solids	01	21	10	-	1
9	Orthographic Projections	01	30	10	-	1
10	Isometric Views	01	30	10	-	1
11	Development of surfaces	01	21	10	-	1
Total		**14**	**180**	**80**	**04**	**06**

Course Objectives and Course Outcomes

Course Objectives		Upon completion of the course the student shall able to understand the basic graphic skills and use them in preparation of engineering drawings, their reading and interpretation	
Course Outcomes	**CO1**	EE-107.1	Practice the use of engineering drawing instruments
	CO2	EE-107.2	Familiarise with the conventions to be followed in engineering drawing as per BIS
	CO3	EE-107.3	Construct the i) basic geometrical constructions ii) engineering curves
	CO4	EE-107.4	Visualise and draw the orthographic projections of i) Points ii) Lines iii) Regular Planes iv) Regular Solids V) Sections of Regular Solids
	CO5	EE-107.5	Visualise and draw the isometric views of machine components
	CO6	EE-107.6	Draw the developments of surfaces of regular solids and use them to make the components used in daily life

PO-CO Mapping

Course Code :EE-107	**Course Title: ENGINEERING DRAWING Number of Course Outcomes: 06**				**No. of Periods: 180**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO2, CO3, CO4, CO5, CO6	50	42	3	**>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately Addressed 5 to 25% Level 1 Low addressed <5% Not addressed**
PO2	CO1, CO2, CO3, CO4, CO5, CO6	30	25	2	
PO3	CO1, CO2, CO3, CO4, CO5, CO6	30	25	2	
PO4					
PO5					
PO6					
PO7	CO1, CO2, CO3, CO4, CO5, CO6	10	08	1	

EE-107	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2				1	2	3	1
CO2	3	2	2				1	2	3	1
CO3	3	2	2				1	2	3	1
CO4	3	2	2				1	2	3	1
CO5	3	2	2				1	2	3	1
CO6	3	2	2				1	2	3	1

3: High, 2: Moderate,1: Low

LEARNING OUTCOMES

Upon completion of the course the student shall able to

1.0 Understand the basic concepts of Engineering Drawing

1.1 State the importance of drawing as an engineering communication medium

1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.

1.3 Explain the linkages between Engineering drawing and other subjects ofMechanical Engineering.

2.0 Use of Engineering Drawing Instruments

2.1 Select the correct instruments to draw the different lines / curves.

2.2 Use correct grade of pencil to draw different types of lines and for different purposes

2.3 Select and use appropriate scales for a given application.

2.4 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.

2.5 Prepare Title block as per B.I.S. Specifications.

2.6 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having two exercises)

3.0 Write Free Hand Lettering and Numbers

3.1 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height.

3.2 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height.

3.3 Select suitable sizes of lettering for different layouts and applications.

Drawing plate 2: (Having 5 to 6 exercises)

4.0 Understand Dimensioning Practice

4.1 Acquaint with the conventions, notations, rules and methods of dimensioning in engineering drawing as per the B.I.S.

4.2 Dimension a given drawing using standard notations and desired system of dimensioning.

Drawing Plate 3: (Having 08 to10 exercises)

5.0 Apply Principles of Geometric Constructions

5.1 Practice the basic geometric constructions like i) dividing a line into equal parts
ii) exterior and interior tangents to the given two circles
iii) tangent arcs to two given lines and arcs

5.2 Draw any regular polygon using general method when
i) side length is given ii) inscribing circle radius is given iii) describing circle radius is given

5.2 Draw the conics using general and special methods,

5.3 Draw the engineering curves like i) involute ii) cycloid iii) helix

5.4 Identify the applications of the above constructions in engineering practice.

Drawing Plate -4: Having problems up to construction of polygon

Drawing Plate -5: Having problems of construction of conics

Drawing Plate -6: Having problems of construction of involute, cycloid and helix

6.0 Projections of points, lines, planes & auxiliary planes

6.1 Explain the basic principles of the orthographic projections

6.2 Visualise and draw the projection of a point with respect to reference planes (HP&VP)

6.3 Visualise and draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)

6.4 Visualise and draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)

6.5 Identify the need of Auxiliary views for a given engineering drawing.

6.5 Draw the auxiliary views of a given engineering component .

Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)

Drawing Plate -8: Having problems of projection of planes (6 exercises)

Drawing Plate -9: Having problems on auxiliary planes (Having 4 exercises)

7.0 Draw the Projections of Solids

7.1 Visualise and draw the projections of regular solids like Prisms, Pyramids, Cylinder, Cone...(up to axis of solids parallel to one plane and inclined to other plane)

Drawing plate No.10: Having problems of projection of solids (10 exercises)

8.0 Appreciate the need of Sectional Views

8.1 Identify the need to draw sectional views.

8.2 Differentiate between true shape and apparent shape of section

8.3 Draw sectional views and true sections of regular solids by applying the principles of hatching.

Drawing Plate–11: Having problems of section of solids (6 exercises)

9.0 Apply principles of orthographic projection

9.1 Draw the orthographic views of an object from its pictorial drawing.

9.2 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate 12 : (Having 10 to 12 exercises)

10.0 Prepare pictorial drawings

10.1 identify the need of pictorial drawings.

10.2 Differentiate between isometric scale and true scale.

10.3 Prepare Isometric views from the given orthographic drawings.

Drawing plate 13: (Having 10 to 12 exercises)

11.0 Interpret Development of surfaces of different solids

11.1 State the need for preparing development drawing.

11.2 Draw the development of simple engineering objects and their truncations (cubes, prisms, cylinders, cones, pyramid)

11.3 Prepare development of surface of engineering components like

i) funnel ii) 90^0 elbow iii) Tray

Drawing plate No. 14: (Having 05 exercises)

Competencies and Key competencies to be achieved by the student

S.No	Major topic	Key Competency
1.	Importance of Engineering Drawing	• Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	• Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	• Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	• Dimension a given drawing using standard notations and desired system of dimensioning
5.	Geometrical construction	• Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	• Draw the projections of points, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Auxiliary views	• Draw the auxiliary views of a given Engineering component • Differentiate between Auxiliary view and apparent view
8.	Sections of Solids	• Differentiate between true shape and apparent shape of section • Apply principles of hatching. • Draw simple sections of regular solids
9.	Orthographic Projection	• Draw the minimum number of views needed to represent a given object fully.
10.	Isometric Views	• Differentiate between isometric scale and true scale. • Draw the isometric views of given objects,.
11.	Development of surfaces	• Prepare development of Surface of regular solids and other components like i) funnel ii) 90^0 elbow iii) Tray

COURSE CONTENTS:

NOTES:

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils - Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet,

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering
Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm)
Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing -Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features "Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts
Construction of tangent lines: to draw interior and exterior tangents to two circles of given radii and centre distance
Construction of tangent arcs:
i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).
ii)Tangent arc of given radius touching a circle or an arc and a given line.
iii)Tangent arcs of radius R, touching two given circles internally and externally.
Construction of polygon: construction of any regular polygon by general method for given side length, inscribing circle radius and describing/superscribing circle radius
Conics: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. Applications viz., Projectiles, reflectors, Cooling Towers, P-V Diagram of a Hyperbolic process - Construction of any conic section of given eccentricity by general method - Construction of ellipse by concentric circles method, Oblong Method and Arcs of circles method - Construction of parabola by rectangle method and Tangent method - Construction of rectangular hyperbola

General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz., Gear tooth profile, screw threads, springs etc. – their construction

6.0 Projection of points, lines and planes & auxiliary views

Classification of projections, Observer, Object, Projectors, Projection, Reference Planes, Reference Line, Various angles of projections –Differences between first angle and third angle projections

Projections of points in different quadrants

Projections of straight line -

(a) Parallel to both the planes.
(b) Perpendicular to one of the planes.
(c) Inclined to one plane and parallel to other planes

Projections of regular planes

(a) Plane parallel to one of the reference planes
(b) Plane perpendicular to HP and inclined to VP and vice versa.

Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

7.0 Projections of regular solids

(a) Axis perpendicular to one of the planes
(b) Axis parallel to VP and inclined to HP and vice versa.

8.0 Sections of Solids

Need for drawing sectional views – what is a sectional view - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection - Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object - Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Isometric axes, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and true scale - difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines – Drawing the isometric views for the given orthographic projections -Use of box / offset method

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work-Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other - Development of simple solids like cubes, prisms, cylinders, cones, pyramid and truncation of these solids-Types of development: Parallel line and radial line development -Procedure of drawing development of funnels, 90^0 elbow pipes, Tray.

REFERENCE BOOKS

1. P I Varghese-Engineering Graphics– (McGraw-hill)
2. Basant Agarwal & C.M Agarwal-Engineering Drawing - (McGraw-hill)
3. N.D.Bhatt.-Engineering Drawing-charotar publication
4. T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.

SP-46-1998 – Bureau of Indian Standards.

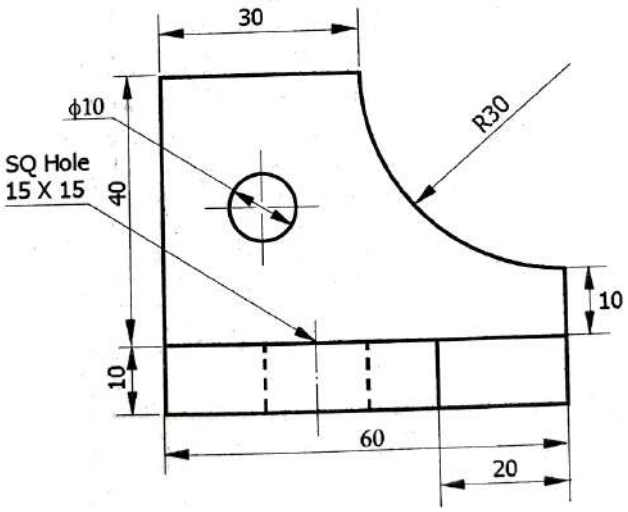
BOARD DIPLOMA EXAMINATIONS
MODEL QUESTION PAPER
DEEE – I-YEAR
EE-107 :: ENGINEERING DRAWING

PART – A **05 x 04=20**

Instructions: **i.** **All the dimensions are in mm**
ii. **Use first angle projections only**
iii. **Due weightage will be given for the dimensioning and neatness**

Answer all the questions. Each question carries FIVE marks

01. Write the following in single stroke capital vertical lettering of size 10mm
ORTHOGRAPHIC PROJECTIONS
02. Redraw the given fig. and dimension it according to SP-46:1988.Assume suitable scale.



03. Draw internal common tangents to two unequal circles of radii 26mm and 20mm.Thedistance between the circles is 75mm.
04. Draw the projections of a regular pentagon of side length 40 mm inclined to the H.P. by 30^0 and perpendicular to V.P. using auxiliary plane method

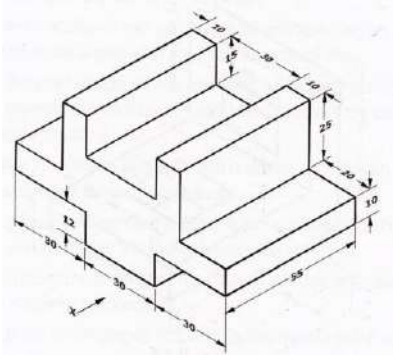
PART – B **10 X 04 = 40**

Answer any FOUR of the following questions. Each question carries TEN marks

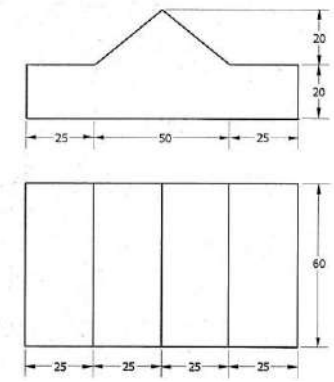
05. Draw the involute of a circle of diameter 30 mm and also draw a tangent to the curve at a distance of 60 mm from the centre of the circle.
06. A right circular cone of height 80 mm and base radius 60 mm is resting in the H.P. on one of its generators and its axis is parallel to V.P. Draw the projections of the solid.
07. A regular hexagonal prism of height 80 mm and base side 40 mm is resting in the H.P. on its base. It is cut by an auxiliary inclined plane of 60^0 inclination passing through the axis at a distance of 30 mm from the top base. Draw the sectional views of the solid and the true section.

08. A pentagonal pyramid of height 80 mm and base side 40 mm is resting in the H.P. on its base such that one of the sides of the base is perpendicular to the V.P. It is cut by a section plane perpendicular to the V.P. and inclined to the H.P. by 60^0 and passing through the axis at a distance of 25 mm from the base. Draw the development of the lateral surface of the truncated pyramid.

09. Draw the front view, top view and left side view of the object shown in the fig.



10. Draw the isometric view of the component whose orthographic projections are given below



ELECTRICAL WORKSHOP &WIRING PRACTICELABORATORY

Coursecode	Course title	No. of periods/ week	Total no.of periods	Marks for FA	Marks for SA
EE-108	ELECTRICAL WORKSHOP & WIRING PRACTICE LABORATORY	06	180	40	60

S.no	Chapter Title	No.of Periods	CO'S Mapped
1	Wiring tools and Accessories	15	**CO1**
2	Electrical Wiring Joints and Soldering Practice	18	**CO2**
3	Lamp Circuits	36	**CO2**
4	Earthing	15	**CO3**
5	DC and AC circuits	21	**CO4**
6	Resistance Measurement	18	**CO5**
7	Capacitance Measurement	21	**CO5**
8	Battery voltage measurement	15	**CO5**
9	Test and repair the Domestic appliances	21	**CO5**
TOTAL		**180**	

Course objectives	1) To familiarise with the knowledge of different wiring tools used in electricalwiring 2) To know the etiquette of working in the domesticwiring 3) To identify and rectify the simple faults that can occur in domesticappliances

Course outcomes	CO1	EE-108.1	Understanding various tools and know their usage
	CO2	EE-108.2	Perform different joints, Soldering practice and execute different wiring circuits
	CO3	EE-108.3	Perform methods of earthing
	CO4	EE-108.4	Identify the difference between DC and AC
	CO5	EE-108.5	Measurement and Calculation of electrical parameters like resistance, capacitance, battery voltage and testing and repairing of domestic applications.

LEARNING OUTCOMES

Wiring Tools andAccessories

1.1 Identify the following electrical wiring tools with respect to
i)Size ii)Shapeiii)Purposeiv)Speedv) Use
a) Screw drivers
b) Pliers
c) Drilling machines & DrillingBits.
d) Rawl plug jumper, andpoker
e)Voltage/linetester
f) Splicers (insulationremover)
g)Standard Wiregauge

1.2 Identify different types of Electrical Wiring accessories with respect to
i)Size ii)Shape iii)Purpose iv)Use.
a) Switches
b) Ceilingroses
c) Lamp Holders andAdopters
d) Sockets
e) Plug
f) Fuses

1.3 Identify different types of main switches with respect to
i)Rating ii)Purpose iii)Use.
SP,DP mains, TP,ICDP, ICTP, SPDT, DPDT, TPDT, Changeover-Knife type, Rotary,Micro, Modular switches, 2-pole and 3-pole MCBs

1.4 Study different types of wires and cables (1/18,3/20,7/20) with respect to sizes rating, purpose and useetc

Electrical WiringJoints and Soldering Practice

2.1 Prepare Straight joint/ Marriedjoint
2.2 Prepare Tjoint
2.3 Prepare Western unionjoint
2.4 Prepare Pigtailjoint
2.5 Femialirisation to use soldering tools and components
2.6 Soldering simple electronic circuits on PCB

LampCircuits

3.1 Make a circuit with One lamp controlled by one switch with PVC surface conduitsystem
3.2 Make a circuit with Two lamps controlled by two switches with PVC surface conduitsystem
3.3 Make a circuit with One lamp controlled by one switch and provision of 2/3-pinsocket.
3.4 Make a circuit for Stair casewiring
3.5 Make a circuit for Godownwiring
3.6 Control two Lamps by Series - Parallel connection using one 1-way switch & two 2-way switches with PVC surface conduitsystem.
3.7 Controltwosub-circuitsthroughEnergymeter,MCB'sandtwo1-wayswitches.

3.8 Prepare switch board with star delta starter, MCB, Pilot lamps for 3 phasemotor
3.9 Control and practice the wiring for FluorescentLamp
3.10 Connect Computer by main switch board with a miniature circuitbreaker.

Earthing

4.1 Prepare PipeEarthing.
4.2 Prepare PlateEarthing.

DC and ACcircuits

5.1 Demonstrate unidirectional current flow with 12 Vbattery
5.2 Determine polarity using a Voltmeter/LED
5.3 Demonstrate AC using a Low voltageTransformer
5.4 Practice Series and Parallel connection ofLamps
5.5 Practice Bright and Dim light arrangement (using a series Lamp/using a Diode)

Resistancemeasurement

6.1 Identify different types ofresistors
6.2 Calculate Resistance by its colourcode
6.3 Measuring the resistance usingmultimeter
6.4 Connecting resistors in series and parallel and measuring the resistance usingmultimeter6.5 Practice Rheostatconnections

CapacitanceMeasurement

7.1 Identify different types ofcapacitors
7.2 Find the value and specifications of capacitor from Color code and Valueprinted
7.3 Investigate the effect of connecting capacitors in series andparallel
7.4 Testing the capacitor using multimeter

Battery voltagemeasurement

8.1 Measurement of Battery Voltage using Voltmeter andMultimeter
8.2 Connecting batteries in series and parallel and observing the output voltage using Voltmeter andDMM.

8.3 Measurement of current supplied by Battery using Ammeter and Multimeter with Rheostat as load.

Test and repair of the Domesticappliances

9.1 Testing and repair of electricheater
9.2 Testing and repair of iron box and other domesticappliances

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-108.1	3	1						3		
EE-108.2	3			2	1.5			3		
EE-108.3	3		1.5					3	1.5	
EE-108.4	3							3		
EE-108.5	3	2			1			3	1	
Average	**3**	**1.5**	**1.5**	**2**	**1.25**			**3**	**1.25**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

Competencies to be achieved by the Student

S.No	Experiment title	Competencies
1	Handle the differentwiring a) tools andaccessories b) selectswitches,andMCB's c) Identify wiresandcables as per the requirements of theload.	•Identify the size and specifications of various tools used for electricalwiring. • Understand the usage of the standard wiregauge. •Identify the type, size and specifications of DP mains,
2.1	To prepare a Straight joint/Married joint using a 7/20 Al. Cable	• Identify the size of thecable • Perform splicing of Insulationproperly. • Perform Straight joint/Marriedjoint
2.2	To prepare a T joint using a 7/20 Al. Cable	•Insert the leads of the wires properly as per the sketches. • Twist the wiresproperly.
2.3	To prepare a Western union joint using a single strand Al. Cable	• Overlap the two wiresproperly • Twist the binding wiresproperly
2.4	To prepare a Pig tail joint using a single strand Copper Cable	• Place the wires inV-shape. • Twist the wires in clock wisedirection.
2.5	To Femialirise various soldering tools and components	• Identifying Soldering gun, flux, lead

2.6	To solder simple electronic circuits on PCB	• Draw the layout of circuit • Carefully Soldering the circuit on PCB.
3.1	To control one lamp by one 1-way switch with PVC surface conduit wiring system	• Draw wiringdiagram • Identify the size of cable, PVC pipe, type of1-way switch and lampholder. • Make Connections as per WiringDiagram
3.2	To control two lamps by two 1-way switches with PVC surface conduit wiring system	• Draw wiringdiagram • Handle the screw driver, electrician Knife, line tester to fix the PVC pipe using saddles and junctionboxes. • Select colour and length of wire for phase and neutral • Switch on the supply after making of the connections • Disconnect the circuit aftertesting.
3.3	To control one lamp and 2/3 pin socket by two1-way switches with PVC surface conduit wiring system	• Connect 2/3 pin socket properly with respect to phase, neutral andearth. • Connect phase wire throughswitches.
3.4	Stair-case wiring	• Select two 2-wayswitches • Connect 2- way switches as per circuitdiagram. • Test with 1-phase, 230V, 50 Hz supply to the circuit connected through ICDPswitch.
3.5	Godown wiring scheme	• Draw wiringdiagram • Connect the circuit as per thediagram. • Observe sequence of operation ofswitches • Test with 1-phase,230 V,50 Hz supply to the circuit, neutral wire to the bottom point of the 1- way switch and phase to the first point of lamp holder
3.6	Series-Parallel connection	• Select colour and length of wire for phase and neutral. • Make connections as per wiringdiagram. • Draw wire through PVC pipeproperly • Observe glow intensity of lamps for series and parallelconnections
3.7	Control two sub circuits through Energymeter,MCB'sandtwo1-way switches	• Draw wiringdiagram. • Identify the size of cable,1-way switch, PVC pipe, MCB, capacity of Inverter andSocket • Read the specifications of MCB, capacity of Inverter andSocket • Make connections as per wiringdiagram. • Draw wire through PVC pipeproperly. • Connect supply to Inverter through MCBproperly. • Select appropriate socket with switchcontrol. • Make earth wire connections for requiredpoints.

3.8	Prepare switch board with star delta starter, MCB, Pilot lamps for 3 phase motor	• Select the size of cable, PVC pipe, star-delta starter, MCB and lampholder • Make connections as per wiringdiagram. • Draw wire through PVC pipeproperly. • Draw wire of the 3-phase to the motor through star-delta starter. • Test with 3-phase, 415 V, 50 Hz supply to the circuit connected through ICDPswitch. • Test by changing any two phases of inputsupply
3.9	Wiring practice of fluorescent lamp	• Make connections as per wiringdiagram. • Connect top point and bottom point of the choke to tube lightproperly. • Note the importance and working ofstarter.
3.10	Connect computer by main switch board with a miniature circuit breaker.	• Draw wiringdiagram. • Identify the size of cable, 1-way switch, PVC pipe, MCB andSockets • Read the specifications of MCB andSockets • Make connections as per wiringdiagram. • Connect supply to Computer through MCB properly. • Select appropriate sockets with 1-way switch control. • Make earth wire connections for requirepoints.
4.1	Prepare Pipe Earthing	• Draw earthing diagram withspecifications. • Select suitable GI pipes ,GI wire reducing socket and funnel with wiremesh. • Preparetheearthpitof2.5mbelowthesurface of the ground. • Place Earth pipe in verticalposition. • Draw GI wire to the earthing pipe fastened with bolts &nuts. • Fix the funnel with wire mesh at the top of GI pipe. • Pour sand, char coal and salt in alternate layers of about 15 cm around the earthpipe. • Test the earth resistance withMegger
4.2	Prepare Plate Earthing	• Draw Earthing diagram withspecifications • Select suitable GI plate, GI wire and funnel with wiremesh • Prepare the earth pit of 1.5 m below the surface of the ground • Place Earth plate in verticalposition • Draw GI wire to the GI pipe fastened to GI plate / copper plate with bolts &nuts. • Pour sand, char coal and salt in alternate layers of about 15 cm around the earthpipe. • Test the earth resistance withMegger. • Verify the earth resistance.

5.0	Demonstrate difference between DC and AC	• Connect DC source and measure V &I • Connect proper AC source and measure V&I • Makeinferences.
6.0	Practice Resistance measurement	• Identifying resistor based on the colourcode. • Measuring resistance using Mmultimeter.
7.0	Practice Capacitor measurement	• Identifying capacitor based on the colourcode. • HandlingMultimeter.
8.0	Practice Battery voltage measurement	• HandlingMultimeter • HandlingRheostats
9.0	Testing and repair of domestic appliances	• Inspect the appliancevisually. • Check for anydiscrepancies. • Perform the disassemblingoperation • Test the inner parts for anyfaults • Rectify the faults if any. • Replace the parts ifnecessary. • Perform theassembling. • Test theDomestic appliance for proper functioning.

Note:1.Every student has to bring insulated tool kit and follow the general safety precautions throughout the labsessions

2. Should not touch the live terminals.

PHYSICS LAB PRACTICE
(C-20 CURRIUCULUM COMMON TO ALL BRANCHES)

Subject Code	Subject Title	Periods per week	Total periods per year
EE-109 A	Physics Laboratory	03	45

TIMESCHEDULE

S.No	Name of the Experiment	No.of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination) (**Single**	03
7.	Refractive index of solid using traveling microscope	03
8.	Boyle's law verification	03
9.	Meter bridge	03
10.	Mapping of magnet lines of force and locate null points	03
	DEMONSTRATION EXPERIMENTS	
11.	Surface tension of liquid using traveling microscope	03
12.	Coefficient of viscosity by capillary method	03
	Revision	06
	Test	03
	Total	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice with Vernier calipers to determine the volumes and areas of a cylinder and sphere and their comparison etc .

2.0 Practice with Screw gauge to determine thickness of a glass plate, cross sectional area of a wire and volumes of sphere and also their comparison etc

3.0 Verify the parallelogram law and Triangle law

4.0 Determine the value of acceleration due to gravity using Simple Pendulum

5.0 Determine the velocity of sound in air at room temperature and its value at zero degree centigrade.

6.0 Calculate the Focal length and focal power of convex lenses using distant object method , U-V method , U-V graph and 1 / U – 1 / V graph methods and their comparison.

7.0 Determine the refractive index of a solid using travelling microscope.

8.0 Verify the Boyle's law employing a Quill tube.
9.0 Determine the specific resistance of material of a wirel using Meter Bridge.
10.0 Drawing magnetic lines of force under N-S and N-N methods and locate null points.
11.0 Determine the surface tension of a liquid using travelling Microscope (**Demo)**
12.0 Determine the viscosity of a liquid using capillary method (**Demo)**

Competencies and Key competencies to be achieved by the student

Name of the Experiment	**Competencies**	**Key competencies**
1. Hands on practice on Vernier Calipers(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the physical quantities of given object	• Read the scales • Calculate the requisite physical quantities of given objects
2. Hands on practice on Screw gauge(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire and other quantities	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire and other quantities
3. Verification of Parallelogram law of forces and Triangle law of forces(03)	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum(03)	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph

5. Velocity of sound in air –Resonance method (03)	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound at room temperature • Calculate velocity of sound at 0^0 C
6. Focal length and Focal power of convex lens (Separate & Combination) (03)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v graphs	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graphs
7. Refractive index of solid using traveling microscope(03)	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab

8. Boyle's law verification (03)	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
9. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
10. Mapping of magnet lines of force(03)	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

11. Surface tension of liquid using traveling microscope(03)	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water
12.. Coefficient of viscosity by capillary method(03)	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water

Scheme of Valuation for end Lab Practical Examination :

A. Writing Aim, Apparatus, Formula, Graph, Precautions carries 10 (Ten) Marks
B. For Drawing the table, taking Readings, Calculation work, Drawing the graph, finding result carries 15 (Fifteen) Marks
C. Viva Voice 05 (Five) Marks

Total **30 (Thirty) Marks**

- **Course outcomes**

Course Outcomes	CO1	Experiments with Vernier calipers, Screw gauge, Parallelogram law and Triangle law
	CO2	Experiments with Simple pendulum, Resonance apparatus (Velocity of sound in air)
	CO3	Experiments with Convex lens, Refractive index of solid by travelling microscope
	CO4	Experiments with quill tube (Boyles law verification), Meter bridge, Mapping of magnetic lines of force
	CO5	Experiments with Surface tension and Viscosity

- **COs-PO mapping strength (as per given table)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3			1	1	1	1
CO2	3	2	2		1		
CO3	3		2			1	2
CO4	3	2			2		
CO5	3		1	2		1	2

3 = strongly mapped 2= moderately mapped 1= slightly mapped

CHEMISTRY LABORATORY
(C-20 curriculum common to all Branches)

Subject Code	Subject Title	Periods per week	Total periods per year
EE-109B	Chemistry Laboratory	03	45

CO1	Operate and practice volumetric apparatus and preparation of standard solution
CO2	Evaluate and judge the neutralization point in acid base titration
CO3	Evaluate the end point of reduction and oxidation reaction
CO4	Judge the stable end point of complex formation, stable precipitation
CO5	Judge operate and demonstrate and perform precise operations with instrument for investigation of water pollution parameters

PO CO mapping

Course code C-109B	**Chemistry Laboratory No of Cos;5**			**No Of periods 45**
	Mapped with CO No	**CO periods addressing PO in Col 1 NO %**	**1,2,3**	**remarks**
	CO1,CO2,CO3, CO4,CO5			>40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed)
	CO1,CO2,CO3, CO4,CO5			
	CO1,CO2,CO3, CO4,CO5			
	CO2,CO3, CO4,CO5			

COs-POs mapping strength (as per given table)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3		1				1		
CO2	2	3		2	2			1		
CO3	2	3		2	2			1		
CO4	2	3		2	2			1		
CO5	2	3		2	2			1		

3=strongly mapped
2= moderately mapped
1= slightly mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

TIMESCHEDULE

S.No	Name of the Experiment	No.of Periods	Mapped with COs
1.	a) Recognition of chemical substances and solutions used in the laboratory by senses. b) Familiarization of methods for Volumetric analysis	03	CO1
2.	Preparation of Std Na_2CO_3 and making solutions of different dilution	03	CO1
3.	Estimation of HCl solution using Std.Na_2CO_3 solution	03	CO2
4.	Estimation of NaOH using Std.HCl solution	03	CO2
5.	Estimation of H_2SO_4usingStd.NaOH solution	03	CO2
6.	Estimation of Mohr's Salt using Std.$KMnO_4$	03	CO3
7.	Determination of acidity of water sample	03	CO2
8.	Determination of alkalinity of water sample	03	CO2
9.	Determination of total hardness of water using Std. EDTA solution	03	CO4
10.	Estimation of Chlorides present in water sample	03	CO4
11.	Estimation of Dissolved Oxygen(D.O)in water sample	03	CO5
12.	Determination of pH using pH meter	03	CO5
13.	Determination of conductivity of water and adjusting ionic strength	03	CO5
14.	Determination of turbidity of water	03	CO5
15.	Estimation of total solids present in water sample	03	CO5
	Total:	**45**	

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc. To identify the chemical compounds and solutions by senses.

2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.

3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3solutionfor estimation of HCl

4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0 Conduct titrations adopting standard procedures and using Std.$KMnO_4$solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions
a) To determine conductivity
b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 To determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
Familiarization of methods for Volumetric analysis. Recognition of chemical substances And solutions (03)	-	--
Preparation of Std Na_2CO_3 and making solutions of different dilution(03)	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions
Estimation of HCl solution using Std. Na_2CO_3solution (03)	▪ Cleaning the glassware and rinsing with appropriate	▪ Making standard solutions ▪ Measuring accurately the

Estimation of NaOH using Std.HCl solution (03) Estimation of H_2SO_4 using Std.NaOH solution (03) Estimation of Mohr's Salt using Std.$KMnO_4$ (03) Determination of acidity of water sample (03) Determination of alkalinity of water sample (03) Determination of total hardness of water using Std. EDTA solution (03) Estimation of Chlorides present in water sample (03) Estimation of Dissolved Oxygen(D.O) in water sample (By titration method) (03)	solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
Determination of pH using pH meter (03) Determination of conductivity of water and adjusting ionic strength to required level (03) Determination of turbidity of water (03)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately

Estimation of total solids present in water sample (03)	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

SCHEME OF VALUATION

A)	Writing Chemicals, apparatus ,principle and procedure	5M
B)	Demonstrated competencies	20M
	Making standard solutions	
	Measuring accurately the standard solutions and titrants	
	Effectively controlling the flow of the titrant	
	Identifying the end point	
	Making accurate observations	
C)	Viva-voce	5M

	Total	**30M**

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA
EE-110 (common to all branches)	Computer Fundamentals Lab	3	90	40	60

Time schedule:

S.No.	Chapter/Unit Title	No. of sessions each of 3 periods duration	No.of Periods
1.	Computer hardware Basics	2	6
2.	Windows Operating System	2	6
3.	MS Word	8	24
4.	MS Excel	7	21
5.	MS PowerPoint	5	15
6.	Adobe Photoshop	6	18
	Total periods	**30**	**90**

S.No.	Chapter/Unit Title	No.of Periods	CO's Mapped
1.	Computer hardware Basics	6	CO1
2.	Windows Operating System	6	CO1
3.	MS Word	24	CO2
4.	MS Excel	21	CO3
5.	MS PowerPoint	15	CO4
6	Adobe Photoshop	18	CO5
	Total periods	**90**	

Course Objectives	i)To know Hardware Basics ii)To familiarize operating systems iii)To use MS Office effectively to enable to students use these skills in future courses iv) To use Adobe Photoshop in image editing.

Course Outcomes	At the end of the course students will be able to		
	CO1	EE-110.1	Identify hardware and software components
	CO2	EE-110.2	Prepare documents with given specifications using word processing software
	CO3	EE-110.3	Use Spread sheet software to make calculation and to draw various graphs / charts.
	CO4	EE-110.4	Use Power point software to develop effective presentation for a given theme or topic.
	CO5	EE-110.5	Edit digital or scanned images using Photoshop

CO-PO/PSO MATRIX

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
C-110.1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-110.2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-110.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-110.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-110.5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
Average	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

Learning Outcomes:

I. Computer Hardware Basics

1. a) To Familiarize with Computer system and hardware connections
   b) To Start and Shut down Computer correctly
   c) To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word

Home – Insert- Page layout – References – Review- View.

7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV.Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To sort and filter data in table.
20. To present data using Excel Graphs and Charts.
21. To develop lab reports of respective discipline.
22. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

23. To familiarize with Ribbon layout features of PowerPoint 2007.
24. To create a simple PowerPoint Presentation
25. To set up a Master Slide in PowerPoint
26. To insert Text and Objects
27. To insert a Flow Charts

28. To insert a Table
29. To insert a Charts/Graphs
30. To insert video and audio
31. To practice Animating text and objects
32. To Review presentation

VI. Practice with Adobe Photoshop

33. To familiarize with standard toolbox
34. To edit a photograph.
35. To insert Borders around photograph.
36. To change Background of a Photograph.
37. To change colors of Photograph.
38. To prepare a cover page for the book in your subject area.
39. To adjust the brightness and contrast of the picture so that it gives an elegant look.
40. To type a word and apply the shadows emboss effects.

Key competencies:

Expt No	Name of Experiment	Competencies	Key competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the parts of a Computer system: i). CPU ii). Mother Board iii) Monitor iv) CD/DVD Drive v) Power Switch vi) Start Button vii) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board	a. Login and logout as per the standard procedure b. Operate mouse &Key Board
1 (c).	To Explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager

2.	To check the software details of the computer	a. Find the details of Operating System being used b. Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders	a. Create files and folders Rename , arrange and search for the required folder/file
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin

5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two Word documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table	a. Insert table in the word document and edit b. Use sort option for arranging data.

		b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar-Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit.

15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Perform Mathematical Calculations verify -AutoSum b. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To sort and filter data in table	a. Sort data in multiple columns b. Sort data in a row c. Sort data using Custom order d. Filter data in work sheet	a. Refine the data in a worksheet and keep it organized b. Narrow a worksheet by selecting specific choice
20.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel

21.	To develop lab reports of respective discipline	Create Lab reports using MS Word and Excel	a. Insert Practical subject name in Header and page numbers in Footer
22.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percentage symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
23.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in PowerPoint a. Home b. Insert c. Design d. Animation e. Slideshow f. View g. Review	Access required options in the tool bar
24.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
25.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint g. Add Notes to a PowerPoint Presentation	a. Setup Master slide and format b. Add notes

26.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects	Insert Text and Objects Use 3d features
27.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
28.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
29.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.
30.	To Insert audio & video, Hyperlinks in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files

31.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like Entrance, Emphasis, Motion Paths &Exit	Add animation effects
32.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Hand-out	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show
33	To familiarize with standard toolbox	a. Open Adobe Photoshop b. Use various tools such as i. The Layer Tool ii. The Color & Swatches Tool iii. Custom Fonts & The Text Tool iv. Brush Tool v. The Select Tool vi. The Move Tool vii. The Zoom Tool viii. The Eraser ix. The Crop Tool x. The Fill Tool	Open a photograph and save it in Photoshop
34	To edit a photograph	a. Use the Crop tool b. Trim edges c. Change the shape and size of a photo d. Remove the part of photograph including graphics and text	a. Able to edit image by using corresponding tools.
35	To insert Borders around photograph	a. Start with a single background layer b. Bring the background forward c. Enlarge the canvas d. Create a border color	Able to create a border or frame around an image to add visual interest to a photo

		e. Send the border color to the back f. Experiment with different colors	
36	To change Background of a Photograph	a. open the foreground and background image b. Use different selection tools to paint over the image c. Copy background image and paste it on the foreground. d. Resize and/or drag the background image to reposition. e. In the Layers panel, drag the background layer below the foreground image layer.	Able to swap background elements using the Select and Mask tool and layers.
37	To change colors of Photograph	a. Change colors using: i) Color Replacement tool ii) **Hue/Saturation adjustment layer tool**	Able to control color saturation
38	To prepare a cover page for the book in subject area	a. open a file with height 500 and width 400 for the cover page. b. apply two different colors to work area by dividing it into two parts using Rectangle tool. c. Copy any picture and place it on work area→ resize it using free transform tool. d. Type text and apply color and style e. Apply effects using blended options	Able to prepare cover page for the book
39	To adjust the brightness and contrast of picture to give an elegant look	a. open a file. b. Go to image→ adjustments→ Brightness/Contrast. c. adjust the brightness and contrast. d. Save the image.	Able to control brightness/contrast.

40	To type a word and apply the shadow emboss effects	a. open a file b. Select the text tool and type text. c. Select the typed text go to layer→ layer style→ blended option→ drop shadow, inner shadow, bevel and emboss→ contour→ satin→ gradient overlay d. Save the image.	Able to apply shadow emboss effects

BOARD DIPLOMA EXAMINATIONS

DIPLOMA IN COMPUTER ENGINEERING

MODEL PRACTICAL QUESTION PAPER-YEAR END EXAM

COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE:EE-110**

MAX MARKS:60 **TIME: 3HOURS**

1. Identify the internal hardware components of a PC and assemble them.
2. Identify the external components or peripherals of a PC and connect them.
3. Write the procedure to create the files and folders
4. Write the procedure to access Calculator, Paint and Notepad application
5. Write the procedure to perform the following in MS Word
   (a) Change the Font Size
   (b) Change the Font Style
   (c) Change the Text Size
6. Write the procedure to perform the following in MS Word
   (a) Change the Font Color.
   (b) Use Various Text Alignment Options.
   (c) Format text in Bold, Italic and Underline.
7. Create the hierarchy of your family in MS Word.
8. Write the procedure to perform the following in MS Word:
   (a) Insert a Table
   (b) Add a Row
   (c) Add a column
   (d) Delete a Row
   (e) Delete a column
9. Write the procedure to use Equation $\frac{(x+y)^2}{(x-y)^2} = \frac{x^2+2xy+y^2}{x^2-2xy+y^2}$ and Symbols.
10. Write the procedure to perform the following in MS Excel
    (a) To Modify Column Width
    (b) To Modify Row Height
    (c) Format text in Bold, Italic, and Underline.
11. Write the procedure to create charts and Graphs in MS Excel.
12. Write the procedure to create simple Power Point Presentation on your college in Three slides.
13. Write the procedure to perform Animation on Text and Objects in your presentation.

14. Take a photographic image. Give a title for the image. Put the border. Write your names. Write the Name of Institution and Place.
15. Prepare a cover page for the book in your subject area. Plan your own design.
16. You are given a picture of a flower and associated background (Extract.jpg).Extract the Flower only from that and organize it on a background. Select your own background for organization.
17. You are given a picture (BrightnessContrast.jpg). Adjust the brightness and contrast of the picture so that it gives an elegant look.
18. You are given a picture (position.jpg). Position the picture preferably on a plain background of a color of your choice - Positioning include rotation and scaling.
19. Remove the arrows and text from the given photographic image(Filename: photo.jpg).
20. Type a word; apply the following effects. Shadow Emboss.

III SEMESTER

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS

III SEMESTER

Subject Code	Name of the Subject	Instruction period / week		Total Period /Sem	Scheme of Examination			
		Theory	Practical/Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
EE- 301	Engineering Mathematics - II	4	-	60	3	20	80	100
EE -302	Electrical Machines- I (DC Machines)	4	-	60	3	20	80	100
EE -303	Power System –I (Generation)	4	-	60	3	20	80	100
EE-304	Electrical & Electronic Measuring Instruments	4	-	60	3	20	80	100
EE-305	Electrical circuits	4	-	60	3	20	80	100
EE-306	PROGRAMMING IN ''C''	4	_	60	3	20	80	100
PRACTICAL								
EE-307	Electrical Engineering Drawing – I	-	6	90	3	40	60	100
EE-308	Electrical Machines – I Laboratory	-	3	45	3	40	60	100
EE-309	(c) Programming in CLaboratory (d) Electrical CADLaboratory	-	3 3	45 45	$1_{1/2}$ $1_{1/2}$	20 20	30 30	50 50
EE-310	Electrical Circuits & Measuring Instruments Laboratory	-	3	45	3	40	60	100
	TOTAL	**24**	**18**	**630**		**280**	**720**	**1000**

ENGINEERING MATHEMATICS-II

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
EE-301	Engineering Mathematics-II	4	60	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Indefinite Integration	22	CO1
2	Definite Integration and its applications	24	CO2
3	Differential Equations of first order	14	CO3
	Total Periods	**60**	

Course Objectives	(i) To understand the concepts of indefinite integrals and definite integrals with applications to engineering problems. (ii) To understand the formation of differential equations and learn various methods of solving them.

Course Outcomes	CO1	Integrate various functions using different methods.
	CO2	Evaluate definite integrals with applications.
	CO3	Obtain differential equations and solve differential equations of first order and first degree.

ENGINEERING MATHEMATICS – II

Learning Outcomes

Unit-I

C.O. 1 Integrate various functions using different methods.

L.O. 1.1. Explain the concept of Indefinite integral as an anti-derivative.

1.2. State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\, dx$ and $\int ku\ dx$ where k is constant and u, v are functions of x.

1.3. Solve integration problems involving standard functions using the above rules.

1.4. Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\, dx$ where $f(x)dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\, dx$

iii) $\int f'(x)/[f(x)]\, dx$

iv) $\int f\{g(x)\} g'(x)\, dx$

1.5. Find the integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ using the above.

1.6. Evaluate the integrals of the form $\int \sin^m x \cos^n x\, dx$ where m and n are suitable positive integers.

1.7. Evaluate integrals of suitable powers of $\tan x$ and $\sec x$.

1.8. Evaluate the Standard integrals of the functions of the type $|z|$

1.9. Evaluate the integrals of the type $\sinh x = \frac{e^x - e^{-x}}{2}$.

1.10. Evaluate integrals using decomposition method.

1.11. Solve problems using integration by parts.

1.12 Use Bernoulli's rule for evaluating the integrals of the form $(3-4i)(7+2i)$.

1.13. Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\, dx$.

Unit-II

C.O.2 Evaluate definite integrals with applications.

L.O. 2.1. State the fundamental theorem of integral calculus

2.2. Explain the concept of definite integral.

2.3. Solve problems on definite integrals over an interval using the above concept.

2.4. State various properties of definite integrals.

2.5. Evaluate simple problems on definite integrals using the above properties.

Syllabus for Unit test-I completed

2.6. Explain definite integral as a limit of sum by considering an area.

2.7. Find the areas under plane curves and area enclosed between two curves using integration.

2.8. Obtain the mean value and root mean square value of the functions in any given interval.

2.9. Obtain the volumes of solids of revolution.

2.10. Solve some problems using Trapezoidal rule, Simpson's 1/3 rule for approximation of integrals.

Unit -III

C.O. 3 Form differential equations and solve differential equations of first order and first degree.

L.O. 3.1 Define a Differential equation, its order and degree

3.2 Find order and degree of a given differential equation.

3.3 Form a differential equation by eliminating arbitrary constants.

3.4 Solve the first order and first degree differential equations by variables separable method.

3.5 Solve Homogeneous differential equation of first order and first degree.

3.6 Solve exact differential equation of first order and first degree.

3.7 Solve linear differential equation of the form dy/dx + Py = Q, where P and Q are functions of x or constants.

3.8 Solve Bernoulli's differential equation reducible to linear form.

3.9 Solve simple problems arising in engineering applications.

Syllabus for Unit test-II completed

C-20
Engineering Mathematics – II
CO/PO – Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2				3	1	2
CO2	3	3	3	3				3	3	3
CO3	3	3	3	3				3	3	3
Avg	3	2.6	2.6	2.6				3	2.3	2.6

3 = Strongly mapped (High), **2 =** Moderately mapped (Medium), **1 =** Slightly mapped (Low)

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.
PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.
PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

PSO1: An ability to understand the concepts of basic mathematical techniques and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.
PSO2: An ability to solve the Engineering problems using latest software tools, along with analytical skills to arrive at faster and appropriate solutions.
PSO3: Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

Engineering Mathematics – II
PO- CO – Mapping strength

PO no	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		Number	%		
1	CO1, CO2, CO3	60	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3	60	100%	3	
3	CO1, CO2, CO3	60	100%	3	
4	CO2, CO3	38	63.3%	3	
5					
6					
7					
PSO 1	CO1, CO2, CO3	60	100%	3	
PSO 2	CO1, CO2, CO3	40	66.6%	3	
PSO 3	CO1, CO2, CO3	48	75%	3	

ENGINEERING MATHEMATICS – II

COURSE CONTENTS

Unit-I

Indefinite Integration.

1. Integration regarded as anti-derivative – Indefinite integrals of standard functions. Properties of indefinite integrals. Integration by substitution or change of variable. Integrals of tan x, cot x, sec x, cosec x. Integrals of the form $a+ib$ where at least one of m and n is odd positive integers. Integrals of suitable powers of tanx. secx and cosecx.cotx by substitution.

Evaluation of integrals which are reducible to the following forms:

$(1,1)$

Integration by decomposition of the integrand into simple rational, algebraic functions.

Integration by parts, Bernoulli's rule and integrals of the form $\int e^x [f(x) + f'(x)]\, dx$.

Unit-II

Definite Integral and its applications:

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Mean and RMS values of a function on a given interval Volumes of solids of revolution. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

Unit -III

Differential Equations:

3. Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solutions of differential equations of first order and first degree using methods, variables separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Textbook:

Engineering Mathematics-II, a textbook for third semester diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Schaum's Outlines Differential Equations, Richard Bronson & Gabriel B. Costa
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

BLUE PRINT

S. No	Chapter/Unit title	No of Periods	Weightage allotted	Marks wise distribution of weight age				Question wise distribution of weight age				COs mapped
				R	U	Ap	An	R	U	Ap	An	
0 08 10	**Unit – I: Indefinite Integration**	22	28	11	11	06	*	2	2	2	*	**CO1**
2	**Unit – II: Definite Integration and its applications**	24	33	11	03	19	*	2	1	2	*	**CO2**
3	**Unit – III: Differential Equations of first order**	14	19	03	03	03	*	1	1	1	*	**CO3**
Total		**60**	**70+10***	**25**	**17**	**28**	**10***	**5**	**4**	**5**	**1**	

R: Remembering Type : 25 Marks
U: understanding Type : 17 Marks
Ap: Application Type : 28 Marks
An: Analysing Type : 10 Marks

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Engineering Mathematics – II
Unit Test Syllabus

Unit Test	Syllabus
Unit Test-I	From L.O 1.1 to L.O 2.5
Unit Test-II	From L.O 2.6 to L.O 3.9

UNIT TEST MODEL PAPERS

Unit Test I **C –20, EE-301**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-II**

Sub Code: **M-301**

Time : 90 minutes Max.Marks:40

Part-A **16Marks**

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks and the remaining questions carry **three** marks each.

1. Answer the following.

Evaluate $2x+3y-1=0$ **(CO1)**

Evaluate $2x-y+3=0$ **(CO1)**

$x+y-2=0$ is true/false **(CO1)**

a. Evaluate $x^2+y^2-2x+4y-4=0$ **(CO2)**

2. Evaluate $\frac{\sin 2\theta+\sin 4\theta+\sin 6\theta}{\cos 2\theta+\cos 4\theta+\cos 6\theta}=\tan 4\theta$ **(CO1)**

3. Evaluate $\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}$ **(CO1)**

4. Evaluate $2\sin^2\theta-\sin\theta-1=0$ **(CO1)**

5. Evaluate ΔABC **(CO2)**

Part-B **3×8=24**

Instructions: (1) Answer **all** questions.
(2) Each question carries **eight** marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Evaluate $\angle B=60^0$ (CO1)

or

B) Evaluate $\frac{c}{a+b}+\frac{a}{b+c}=1$ (CO1)

7. A) Evaluate $(2,3)$ (CO1)

or

B) Evaluate $(6,9)$ (CO1)

8. A) Evaluate $(1,-1)$ (CO2)

or

B) Evaluate $x-y+3=0$ (CO2)

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Unit Test II **C –20, EE-301**

State Board of Technical Education and Training, A. P

First Year

Subject name: Engineering Mathematics-II

Sub Code: M-301

Time : 90 minutes Max.marks:40

Part-A **16Marks**

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks and the remaining questions carry **three** marks each.

1. Answer the following.

   a. Volume of the curve $\lim_{x\to 1}\frac{x^2+1}{x+5}$ over the interval $\lim_{\theta\to 0}\frac{\sin 2\theta}{\theta}=2$ when rotated about X-axis is _____ **(CO2)**

   b. Mean value of $\frac{d}{dx}\left(3\tan^{-1}x\right)=?$ over the interval x is_____ **(CO2)**

   c. Order of differential equation $\lim_{x\to 2}\frac{x^5-32}{x^2-4}$ is_____ **(CO3)**

   d. Integrating factor of $3\tan x-4\log x+7^x$ is_____ **(CO3)**

2. Find the mean value of $x^2\sin x$ over the interval x **(CO2)**

3. Find the area enclosed by curve $\frac{2x+3}{3x+4}$ between the lines $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ **(CO2)**

4. Form the differential equation by eliminating the arbitrary constants from $\frac{dy}{dx}$ **(CO3)**

5. Solve $y=x^{\cos x}$ **(CO3)**

Part-B **3×8=24**

Instructions: (1) Answer **all** questions.
(2) Each question carries **eight** marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Find the area bounded between the curve $u(x,y)=\frac{x^4+y^4}{x-y}$ and the line $3y=x^2-6x+17$ **(CO2)**

   (Or)

   B) Find the R.M.S value of $(4,3)$ between the lines $8\,sqcm/\min$ to $5\,cm$ **(CO2)**

7. A) Find the volume of the solid obtained by revolving the ellipse $f(x) = x^3 - 6x^2 + 9x + 15.$ about x axis **(CO2)**

(or)

B) Calculate the approximate value of $A = \left\{0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}\right\}$ by taking $f : A \to B$ using Trapezoidal rule **(CO3)**

8. A) Solve $f(x) = \cos x,$ **(CO3)**

(or)

B) Solve $f.$ **(CO3)**

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END EXAM MODEL PAPERS

STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS EE-301

TIME : 3 HOURS **MODEL PAPER- I** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. 10x3=30M

1. Evaluate $\frac{x}{(x-1)(x-2)}$ **(CO1)**
2. Evaluate $A=\begin{bmatrix}3 & 9 & 0\\ 1 & 8 & -2\end{bmatrix}$ **(CO1)**
3. Evaluate $B=\begin{bmatrix}4 & 0 & 2\\ 7 & 1 & 4\end{bmatrix}$, **(CO1)**
4. Evaluate $A+B$ **(CO1)**
5. Evaluate $A-B.$ **(CO2)**
6. Find the mean value of $\frac{\cos 16^0+\sin 16^0}{\cos 16^0-\sin 16^0}=\tan 61^0.$ from $\frac{\sin 2\theta}{1-\cos 2\theta}=\cot\theta.$ to $\left(\frac{1-i}{2+i}\right).$ **(CO2)**
7. Find the area of the region bounded by the curve $x+2y+3=0$ from $x+2y+8=0.$ to $\lim_{x\to 0}\frac{\sin 77x}{\sin 11x}.$ **(CO2)**
8. Find the order and degree of the differential equation $3\tan x-4\log x-7x^2$ **(CO3)**
9. Solve $x.$ **(CO3)**
10. Solve $x=at^2, y=2at,$ **(CO3)**

PART-B

Answer All questions. Each question carries EIGHT marks. 5x8=40M

11. A) Evaluate $\frac{dy}{dx}.$ **(CO1)**

Or

B) Evaluate $\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}.$ **(CO1)**

12. A) Evaluate $x+y+z=6, x-y+z=2$ **(CO1)**

Or

B) Evaluate $2x-y+3z=9$ **(CO1)**

13. A) Evaluate $\cos x+\cos y=\frac{3}{5}$ **(CO2)**

Or

B) Evaluate $\cos x-\cos y=\frac{2}{7},$ **(CO2)**

14. A) Find the area of the region bounded by the curves $21\tan\left(\frac{x-y}{2}\right)+10\cot\left(\frac{x+y}{2}\right)=0.$ **and** $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\pi$. **(CO2)**

Or

B) Find the R.M.S values of $x+y+z=xyz.$ from $\sqrt{3}\cos\theta-\sin\theta=1.$ to $\Delta ABC,$ **(CO2)**

15. A) Find the volume of the solid generated by revolution of the ellipse $\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}=\frac{s^2}{\Delta}.$ about X-axis **(CO2)**

Or

B) Calculate the approximate value of $(4,2)$ by using Simpson's 1/3rd rule by dividing the range into 10 equal parts. **(CO2)**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16. Solve $(1,5)$ **(CO3)**

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STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS EE- 301

TIME : 3 HOURS **MODEL PAPER-II** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. Evaluate $4x^2+16y^2=1.$ **(CO1)**
2. Evaluate $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ **(CO 1)**
3. Evaluate $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ **(CO 1)**
4. Evaluate $u=\tan^{-1}\left(\frac{x^3-y^3}{x+y}\right),$ **(CO 1)**
5. Evaluate $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u.$ **(CO2)**
6. Find the mean value of $f:R\to R$ over the complete wave. **(CO2)**
7. Find the volume generated by revolving the circle $f(x)=ax+b,$ from $f^{-1}(x).$to

   $\frac{1}{(x+1)(x-2)}$ about x-axis **(CO2)**

8. Obtain the differential equation by eliminating the arbitrary constants A and B

   from the curve $\mathrm{A}=\begin{bmatrix} 0 & -1 & 3 \\ 1 & 0 & 7 \\ -3 & x & 0 \end{bmatrix}$ **(CO3)**

9. Solve *x*. **(CO3)**
10. Solve $\sin^2 82\frac{1}{2}^0-\sin^2 22\frac{1}{2}^0.$ **(CO3)**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11. A) Evaluate $\frac{\cos 3A}{2\cos 2A-1}=\cos A.$ **(CO1)**

    Or

    B) Evaluate $(3-2i).(4+7i)$ **(CO1)**

12. A) Evaluate $(1,2)$ **(CO 1)**

(Or)

B) Evaluate $(3,-4).$ **(CO 1)**

13. A) Evaluate $\lim_{x\to 2} \frac{x^5-32}{x-2}.$ **(CO2)**

(Or)

B) Evaluate $\sqrt{x}-\sec x+\log x$ **(CO2)**

14. A) Find the area bounded between the curves $x.$ and the line $u(x,y)=x^3-3axy+y^3,$. **CO3)**

(Or)

B) Find the R.M.S value of

$\frac{\partial u}{\partial x}$ between the lines $\frac{\partial u}{\partial y}.$ to $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}=(a-b)(b-c)(c-a).$ **(CO2)**

15. A) Find the volume of right circular cone using integration. **(CO2)**

Or

B) Find the approximate value of $x+2y+3z=6, 3x-2y+4z=5$ from $x-y-z=-1$ using Trapezoidal rule by dividing $\frac{\sin 2\theta+\sin 4\theta+\sin 6\theta}{\cos 2\theta+\cos 4\theta+\cos 6\theta}=\tan 4\theta.$ into 5 equal sub-intervals. **(CO2)**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16. Solve $\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}.$ **(CO3)**

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ELECTRICAL MACHINES-I (D.C.MACHINES)

Course code	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-302	ELECTRICAL MACHINES-I(D.C. MACHINES)	4	60	20	80

S. No.	Unit Title	No. of Periods	CO'S Mapped
1.	Fundamentals of D.C Generators	15	CO1
2.	Armature Reaction and Characteristics of D.C Generators.	15	CO2
3.	Fundamentals of D.C Motors	12	CO3
4.	Speed Control and Starters for D.C Motors	10	CO4
5.	Testing of D.C Motors	8	CO5
Total		**60**	

Course Objectives:

Course Objectives	i. To Familiarise knowledge on construction, working principle and characteristics of DC machines and Armaturereaction. ii. To know different methods of speedcontrol. iii. To use different generators and motors for specificapplications. Iv. To understand different tests performed on DCmachines.

Course outcomes:

Course outcomes	**CO1**	**EE-302.1**	Describe the parts of a DC machine and its uses.
	CO2	**EE-302.2**	Analyze armature reaction and commutation for its effects.
	CO3	**EE-302.3**	Analyze the characteristics of a D.C motor for its performance
	CO4	**EE-302.4**	Choose different starters and appropriate method of speed control for a DC motor.
	CO5	**EE-302.5**	Explain various tests on D.C motors.

Learning Outcomes:

Fundamentals of D.CGenerators

1.1 State the method of producing dynamically inducedE.M.F.
1.2 StateFleming'srighthandrule.
1.3 Explain electromechanical energyconversion.
1.4 Explain the working of simple loopgenerator.
1.5 Understand the conversion of AC to DC by Splitring.
1.6 Describe the constructional features of a D.C generator with a legible sketch and list the various materials used for each part.
1.7 State the functions of each part of D.Cgenerator.
1.8 Explain the working of D.Cgenerator.

1.9 List the types of windings -- (i) Lap (ii) Wave.(Single layeronly).
1.10 Define Pole pitch, Y_b, Y_f, Y_R in terms of armatureslots.
1.11 Compare Lap and Wave windings in differentaspects.
1.12 Derive the E.M.F equation of D.C generator in terms of □ ,Z, N, P &Aand solve problems.
1.13 Classify D.C Generators based onexcitation and draw its equivalent circuit by givingtheir voltage andcurrent equations and solve problems .
1.14 State the various losses incurred in a D.CGenerator and draw power flow diagram.
1.15 Define the mechanical, electrical and overall efficiencies of DCGenerator.
1.16 Derive the condition for maximum efficiency of a DCgenerator and Solve Problems.

Armature Reaction and Characteristics of D.CGenerators.

2.1 Define Armature reaction.
2.2 Explain Armature reaction with legiblesketches
2.3 Explain the phenomenonof
(i) Demagnetization (ii) Crossmagnetization.
2.4 Derive theformula fori) AT_d/pole ii) AT_c /Pole.
2.5 Solve simple problems on AT_d / pole; AT_c /Pole
2.6 State and explain Commutation.
2.7 List the different methods of improvingcommutation.
2.8 Explain methods of improvingcommutation.
(i) Resistance commutation (ii) EMF commutation (iii) Compensating winding methods
2.9 Plot and Explain Open Circuit Characteristics, Internal characteristics and external characteristics of the following types of D.C.Generators:
(i)Separatelyexcited (ii) Shunt
(iii)Series (iv) Compound
2.10 Determine the critical field resistance and critical speed of DC generators from Open circuitCharacteristics.
2.11 State the conditions for Build-up of E. M. F. of DCgenerator.
2.12 State the necessity & Conditions for parallel operation of generators.
2.13 Understand the use of Equalizer rings in parallelOperation.
2.14 List the applications of D.Cgenerators.

Fundamentals of D.C.Motors

3.1 State the usage of the DC machine as a generator and as amotor.
3.2 StateFleming'slefthandrule.
3.3 Explain the working of D.C. motor.
3.4 Explain the significance of back E.M.F by stating itsformula.
3.5 Classify DCmotors.
3.6 Write the formula for Back E. M. F for different D.C Motors with equivalentcircuits.
3.7 Solve Problems on BackE.M.F.
3.8 DefineTorque
3.9 Derive Torque equation of a D.Cmotor and solve problems.
3.10 Develop the formulaefor
(i) Armature torque (T_a) ii) Shafttorque(T_{sh}) iii) Loss torque(T_L).
3.11 List the different losses in a D.Cmotor.
3.12 State the various Power Stages in D.C.motor.
3.13 Plot andExplainthei) Electricalcharacteristicsandii)Mechanical characteristics of the following types of D. C. Motors(a) Shuntb)Seriesc)compound
3.14 List the applications of the various D.Cmotors.

Speed Control of D.C Motors and Starters for D.CMotors

4.1 Explain the necessity of speed control of DCMotors.
4.2 List different types of Starters for DCmotors.
4.3 Explain the three different methods of speed Control (Flux, Armature and voltage) for D.C shuntmotors.
4.5 Explain the different methods of speed control of seriesmotor.
4.6 State the necessity of astarter.
4.7 Explain the working of 3-point starter with legiblesketch.
4.8 Explain the working of 4-point starter with legiblesketch.

Testing of D.CMotors

5.1 Describe the direct and indirect methods of testing of the D.C.Motors.
5.2 List different tests of D.C.Motors.
5.3 Explain the method of conducting brake test on D.C Series, Shunt and Compound motors.
5.4 ExplainthemethodofconductingSwinburne'stest.
5.5 Explain Hopkinson's test
5.6 Solve simple Problems on theabove tests.

CO-PO/PSO MATRIX:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-302.1	3							3	2	
EE-302.2	3							3		
EE-302.3	3	3						3		
EE-302.4	3							3	2	
EE-302.5	3		2		2			3	2	1
Average	3	3	2		2			3	2	1

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENT

Fundamentals of D.CGenerators

Dynamically induced E.M.F- Fleming's right hand rule - electromechanical energy conversion - simple loop generator - principle of D.C generator- functions of each part of D.C generator with legible sketches- windings (i) Lap (ii) Wave -Classification of generators based on excitation- E.M.F equation - losses incurred in the D.C machines -Voltage and Current equations for different types ofD.C Generators- Power stages in DC generators- efficiency calculation.- condition for maximum efficiency -simple problems.

Armature Reaction and Characteristics of D.CGenerators.

Armature reaction, Demagnetization & Cross magnetization-Derive for AT_d, AT_c / Pole.,- simple problems –Commutation -Resistance commutation, EMF commutation and Compensating windingmethods of improving commutation -O.C.C of Separately excited, Shunt, Series and Compound generators- Conditions for (i) Building up of E.M.F.- Critical field resistance and critical speed from O.C.C - parallel operation of generators - Applications of D.C generators.

Fundamentals of D.CMotors

Usage of a DC machine as a generator and a motor-Fleming's left hand rule - working of D.C motorsclassification - significance of back E.M.F- Formula for back E.M.F for different D.C motors- Problems on E.M.F equation – Torque-Torque equation of Dc motor - Armature torque (T_a) , shaft torque (T_{sh}) and loss torque - Different losses - electrical and mechanical characteristics of D.C Shunt, Series and compound motors- Power stages - Applications of D.Cmotors.

Speed Control and Starters for D.CMotors

Necessity of speed control- Types of Starters- Direct and Indirect methods of speed control-different methods (Flux, Armature and Voltage) of speed controls for D.C shunt motors-State the advantages and disadvantages of above methods-different methods of speed control for series motors- problems -necessity of starter- 3-point starter, 4-pointstarter.

Testing of D.CMotors

Direct and indirect methods of testing of the D.C. Motors - Brake test on different types of D.C motors-Swinburne's test – Hopkinson's test - problems.

REFERENCE BOOKS

1. B.L. Theraja, A.K.Theraja– A Textbook of Electrical Technology - Vol - I –S.Chand&co.
2. B.L. Theraja,A.K.Theraja -A Textbook ofElectrical Technology - Vol –II -S.Chand&co.
3. P.S. Bhimbhra –Electricalmachinery-Khanna Publishers
4. M.V.Deshpande –ElectricalMachines-PHI
5. D.P.Kothari,I. J.Nagarath - Electric Machines–Tata McGraw-Hill Education 2004.
6. Audel-Electric motors-Rex Miller,Mark Richard Miller.

Blue print:

S.No.	Unit Title	No. of period s	Weightage allocated		Question wise distribution of weightage							CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1.	Fundamentals of D.C Generators	15	17		6	**3**	8		2	1	1		CO1
2.	Armature Reaction and Characteristics of D.C Generators.	15	14	*	3	**3**	8	*	1	1	1	*	CO2
3.	Fundamentals of D.CMotors	12	14	*	3	3	8	*	1	1	1	*	CO3
4.	Speed Control and Starters for D.C Motors	10	14		3	3	8		1	1	1		CO4
5.	Testing of D.C Motors	8	11		3	**0**	8		1	0	1		CO5
Total		**60**	**70**	**10***	**18**	**12**	**40**	**10***	**6**	**4**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model Papers:Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test - I	From 1.1 to 2.14
Unit Test - II	From 3.1 to 5.5

MODEL PAPER – FORMATIVE ASSESMENT-1

C-20-EE-302

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – THIRD SEMESTER EXAMINATION

EE-302 : ELECTRICAL MACHINES – I (DC MACHINES)

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**

ii. **First question carries four marks and remaining each question carries three marks.**

iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) The distance between two coil sides connected to the same commutator segment is called _____ .
   (b) The friction and windage losses are called Iron losses : True / False.
   (c) The function of commutator in a D.C. Machine is _____ .
   (d) D.C. Machine which converts mechanical energy into Electrical energy is called_____ **(CO1, CO2)**
2. State Flemings right hand rule. **(CO1)**
3. Define back pitch (Y_B) , front pitch (Y_F) and resultant pitch (Y_R). **(CO1)**
4. What is armature reaction? **(CO2)**
5. List the applications of D.C. generators. **(CO2)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**

ii. **Each question carries eight marks.**

iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) A D.C. Shunt generator supplies a full load current of 120 A at 110 V. The shunt field resistance is 55 ohm and mechanical and core losses together are 600 W. If the full load efficiency is 85 percent .Calculate the armature resistance and load current corresponding to maximum efficiency. **(CO1)**

   (or)

   (b) In a 110 V , D.C Compound generator the resistance of the armature ,shunt and series windings are 0.06 ohm, 25 ohm and 0.04 ohm respectively. The load consists of 110 lamps each rated at 100 watts , 110 V. Find the total electromotive force and armature current when the machine is connected (i) Long shunt (ii) Short shunt .Neglect armaturereaction and brush drop. **(CO1)**
7. (a) Explain the open circuit characteristics , internal characteristics and external characteristics of D.C. Shunt generator. **(CO2)**

   (or)

   (b) A 250 V, 25 KW, 4-pole D.C. generator has 164 wave connected armature conductors. When the machine is delivering full load, the brushes are given a lead of 7.2 electrical degrees .Calculate (i) The demagnetising AT/Pole (ii) Cross magnetising AT /Pole.**(CO2)**
8. (a) Explain the process of commutation of DC generator with neat sketches. **(CO2)**

   (or)

   (b) Explain the armature reaction in D.C. Generator. **(CO2)**

***

C-20-EE-302

MODEL PAPER – FORMATIVE ASSESMENT-2

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – THIRD SEMESTER EXAMINATION

EE-302 : ELECTRICAL MACHINES-I (D.C.MACHINES)

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all **five** questions.
ii. First question carries **four** marks and remaining each question carries **three** marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Flemings left hand rule is used to identify _____.

   (b) Three Point Starter is used to start _____ type of DC Motor.

   (c) In case of DC Motors the starter is used to limit the Voltage : **True / False**.

   (d) Swinburnes Test on DC Motor is conducted on No-Load : **True / False. (CO3, CO4,CO5)**

2. State different types of losses in DC Motor. **(CO3)**

3. State the need of Starter in DC Motors. **(CO4)**

4. State the applications of DC Shunt and DC Series motors. **(CO3)**

5. List the types of Tests to be conducted to Know the performance of DC Motors. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all **three** questions.
ii. Each question carries **eight** marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Derive the torque equation in DC Motor. **(CO3)**

   (or)

   (b) A 4-pole , 500 Volt Wave wound DC shunt motor has 720 Conductors on its armature. The full load armature current is 60 A and flux per pole is 0.03Wb. The armature resistance is 1.2Ω and the brush contact drop is 1V/brush. Calculate the full load speed of the motor. **(CO3)**

7. (a) Explain the working of 3-point starter with wiring connections. **(CO4)**

   (or)

   (b) Explain the working of 4-point starter with wiring connections **(CO4)**

8. (a) Explain the method of Conducting brake test on DC Shunt Motor. **(CO5)**

   (or)

   (b) Explain the method of Conducting Swinburnes test on DC Shunt Motor. **(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION

C-20-EE-302

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – THIRD SEMESTER EXAMINATION

EE-302 : ELECTRICAL MACHINES – I (DC MACHINES)

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. State Flemings right hand rule. **(CO1)**
2. Define back pitch (Y_B) , front pitch (Y_F) and resultant pitch (Y_R). **(CO1)**
3. A 4-pole D.C. Generator having a lap wound armature conductors has 51 slots with each slot containing 20 conductors .Find the emf generated when the machine is driven at 1500 rpm assuming flux per pole to be 7.0 m wb. **(CO1)**
4. What is armature reaction? **(CO2)**
5. List the applications of D.C. generators. **(CO2)**
6. State various power stages of D.C. Motor. **(CO3)**
7. What is the significance of back e.m.f in a D.C. Motor? **(CO3)**
8. What is the necessity of a starter for D.C. Motors? **(CO4)**
9. State the advantages and disadvantages of speed control of D.C. Shunt motor by flux control method. **(CO4)**
10. In a brake test conducted on D.C. Shunt motor the effective load on the brake pulley was 30 Kg, the effective diameter of the brake pulley 64 cm and speed was 1200 rpm. Calculate the output power. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) A D.C. Shunt generator supplies a full load current of 120 A at 110 V. The shunt field resistance is 55 ohm and mechanical and core losses together are 600 W. If the full load efficiency is 85 percent .Calculate the armature resistance and load current corresponding to maximum efficiency. **(CO1)**

(or)

(b) In a 110 V , D.C Compound generator the resistance of the armature ,shunt and series windings are 0.06 ohm, 25 ohm and 0.04 ohm respectively. The load consists of 110 lamps each rated at 100 watts , 110 V. Find the total electromotive force and armature current when the machine is connected (i) Long shunt (ii) Short shunt .Neglect armature reaction and brush drop. **(CO1)**

12. (a) Explain the open circuit characteristics , internal characteristics and external characteristics of D.C. Shunt generator. **(CO2)**

(or)

(b) A 250 V ,25 KW ,4-pole D.C. generator has 164 wave connected armature conductors . When the machine is delivering full load ,the brushes are given a lead of 7.2 electrical degrees .Calculate (i) The demagnetising AT/Pole(ii) Cross magnetising AT /Pole.**(CO2)**

13. (a) Draw the equivalent circuits and write the back emf formulas for D.C. Shunt, D.C. Series and D.C. Short shunt compound motors. **(CO3)**

(or)

(b) Derive the torque equation of a D.C. Motor and write the formulas for armature torque, shaft torque and lost torque. **(CO3)**

14. (a) Explain three different methods of speed control of D.C .series motors. **(CO4)**

(or)

(b) Explain the working of D.C. Three point starter with legible sketch. **(CO4)**

15. (a) Explain with a neat sketch the method of conducting brake test on D.C. series motor. **(CO5)**

(or)

(b) Explain how the efficiency of a D.C. Machine is determined using the Swinburne's test with a neat circuit diagram and necessary equations. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**

ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. A generator fails to build up voltage.what might be the reasons? How do you rectify it?**(CO2)**

***

POWER SYSTEMS – I(GENERATION)

Course code	Course title	No.of periods/week	Total no. of periods	Marks for FA	Marks forSA
EE-303	POWER SYSTEMS – I (GENERATION)	4	60	20	80

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Sources of Electrical Energy	**07**	CO1
2	Thermal Power Station	**14**	CO2
3	Hydro Electric Power Station	**10**	CO3
4	Nuclear & Gas Power Station	**13**	CO4
5	Combined Operation and Economics	**16**	CO5
Total		**60**	

Course Objectives	To understand the various sources for electric powergeneration To Explain the working of various plants for powergeneration ToFamiliarise thefundamentalconceptsofCombinedoperationandeconomics.

Course outcomes	**CO1**	EE-303.1	Summarize various sources of power generation
	CO2	EE-303.2	Analyze the working ofThermal power plant
	CO3	EE-303.3	Analyze the working of hydro power plants with merits and demerits
	CO4	EE-303.4	Analyze the working of Nuclear and Gas power stations.
	CO5	EE-303.5	Analyze the concept of load dispatching and tariffs.

LEARNING OUTCOMES

Sources of ElectricalEnergy

1.1 Know the different sources of energy and classify them into conventional and Non-conventionaltypes.

1.2 State necessity of developing non-conventional methods of powergeneration.

1.3 Describe the construction and workingof
(i) Solar Powerplant
(ii)Tidal Powerplant
(iii)Wind Powerplant
(iv) Biomass Powerplant

1.4 State the relative merits and limitations of Conventional and Non- Conventional types of sources

1.5 Appreciate the need of energy conservation and itsmethods.

Thermal PowerStation.

2.1 Introduction to thermal power station and general principle ofworking.
2.2 State the factorsrequired for selection ofsite.
2.3 Draw the detailed line diagram of a condensing type thermal powerstation and explain the principle of working of each component ofthermal powerstation.
2.4 Comprehend the losses of energy and methods to improve theefficiency.
2.5 State the advantagesof
(i) Pulverisation and the machine used forit
(ii) Cooling towers and theirtypes.
2.6 Comprehend the main controls at i) Boilers, ii) Turbines, iii)Condensers,(iv) Alternators.
2.7 Comprehend the centralized controls and indications at controlroom.
2.8 State the causes of pollution and methods to controlthem.
2.9 State the advantages and disadvantages of Thermal power plants.

Hydro Electric powerstations.

3.1 Comprehend the principle of working of Hydro powerstation.
3.2 State the factors required for selection of site for Hydro powerstation.
3.3 ExplainHydrograph.
3.4 Derive waterpower equation and define various hydraulic terms used and Solve numericalproblems.
3.5 ClassifytheH.E.P'sbaseduponhead,duty,locationandhydraulic considerations.
3.6 Explain with layout diagram working of i) High Head ii) Medium Head iii) Low Head Powerstations.
3.7 Explain the need and workingof
(i) Surge Tank ii) Forebay iii)Spillgates.
3.8 State the main controlsat
(i) Head works (ii) Turbine (iii) Alternators.
3.9 State the advantages and disadvantages of Hydro electric powerstation.

Nuclear & Gas PowerStations.

4.1 Introduction to nuclear energy
4.2 State merits and risks involved in using nuclearenergy
4.3 List out the nuclear fuels.
4.4 Explain fission and fusion reactions
4.5 Give specific examples of fission and fusionreactions.
4.6 Explain types of fission reactions and sustained chainreaction.
4.7 Explain use of moderator in nuclearreactors.
4.8 Explain the working of a moderate type nuclear power station with a block diagram.
4.9 Explain the need and working of coolant, reflector, and control rods. Mention the materials used forthem
4.10 Explain the mechanism of power control by controlrods.
4.11 Explain the measures to control radioactivity.
4.12 List the types of Reactors used in Nuclear Power Station and state the main controls at thereactor.
4.13 Explain the principle of working of gas power station with the help of schematic diagram and mention its merits anddemerits.
4.14 List the main controls for gasturbine.

Combined Operation and Economics Of PowerStations.

5.1 Appreciate increase in use of electrical energy, its production and need for reliability.
5.2 Differentiate between isolated operation and integrated operation of power stations and list the merits of integratedoperation.
5.3 Comprehend the process of integrated operation and need for grid at various voltage levels.
5.4 Understand the concept of load dispatching and itsprocess.
5.5 List the various charges and expenses in power station and classify them as fixed and running.
5.6 Define the terms load curve, load factor, diversity factor and maximumdemand.
5.7 Comprehend the cost of generation and effects of load factor and diversity factor onit.
5.8 Solve problems on abovetopics.
5.9 Explain various types of consumer tariffs and comparethem.
5.10 List the causes of lower power factor.
5.11 State the effects of P.F. on electricity charges and mention the methods to improve it. Solve numerical problems on tariff and power factor improvement.

CO-PO/PSO MATRIX:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-303.1	3							3		
EE-303.2		3						3		
EE-303.3		3		2				3	2	
EE-303.4	2			2				3		
EE-303.5		3	2		1			3	2	
Average	**2.5**	**3**	**2**	**2**	**1**			**3**	**2**	

3-Strongly Mapped **2- Moderately Mapped** **1- Slightly Mapped**

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Sources of ElectricalEnergy
Different sources of energy – Conventional and Non-conventional sources –Methods of generation of energy from different sources of power- construction and working principle of Tidal, Wind and Biomass power plants- Merits and limitations of conventional and Non-conventional sources - Need for energy conservation and their methods.

Thermal PowerStation
ThermalPowerStation –Principleofworking–Factorsforselectionofsite.Blockdiagramof condensing type thermal power station- Thermal power station – Components and principles of working - Losses of energy and methods to improve the efficiency- pulverization, Cooling towers and their

types -Main controls at Boilers, Turbines, Condensers and Alternators - Causes of pollution and methods to controlthem.

Hydroelectric PowerStations

Principle of working of hydroelectric power station – limitations in location and operation. Hydraulic terms used – Water power equation – Classification of hydroelectric power stations based on head, duty, location and hydraulic considerations- Layout diagram of i)High Head ii) Medium Head iii) Low Head Power Stations- Working of surge tank, fore bay, spill gates- Main controls of head works, turbines andalternators.

Nuclear and Gas PowerStations

Nuclear energy, fission and fusion reactions – Merits and risks in using nuclear energy - Nuclear fuels - Fission and fusion reactions with mass-energy balance, Fission reactions and sustained chain reaction – Moderator in nuclear reactors – Working of moderate type nuclear power station with a block diagram- Need and working of coolant, reflector, control rods – Materials used for them- Power control by control rods- measures to control radioactivity- main controls at the reactor- Principle and working of gas power plant, main controls for gas turbine.

Combined Operation and economics of PowerStations

Isolated operation and integrated operation of power stations – Their merits and limitations – Load dispatching and its process –Charges/Expenses involved in power station – Their classification as fixed and running-Load curve, load factor, diversity factor and maximum demand – Effects of load factor and diversity factor in power generation – Solve numerical problems. Consumer tariffs and their comparison – Effect of power factor on the electricity charges and methods to improve it – simple problems - Energy management and conservation.

REFERENCE BOOKS

1. Dr.S.L.Uppal & Prof.S.Rao-Electrical Power Systems-Khanna Publishers
2. Starr A.T-Generation, Transmission and Utilization-Pitman publishiers
3. C.L.Wadhwa,"Electrical Power systems"-New AGE International(P) Ltd.,publishers
4. Non Conventional Energy Guide Lines byNEDCAP
5. J BGuptha-A Course in power systems-KATSON BOOKS
6. S.N.Singh-Electrical Power Generation,Transmission and Distribution-PHI

Blue print:

S.No.	Unit title	No. of periods	Weightage allocated		Marks wise distribution ofweightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1	Sources of Electrical Energy	**07**	6		6	0	0		1	1	0		**CO1**
2	Thermal Power Station	**14**	17	*	3	11	3	*	1	2	1	*	**CO2**
3	Hydro Electric Power Station	**10**	14	*	8	3	3	*	1	1	1	*	**CO3**
4	Nuclear & Gas Power Station	**13**	14	*	3	3	8	*	1	1	1	*	**CO4**
5	Combined Operation and Economics	**16**	19	*	0	3	16	*	0	1	2	*	**CO5**
Total		**60**	**70**	**10***	**20**	**20**	**30**	**10***	**4**	**6**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Unit Test	Learning Outcomes to be Covered
Unit Test - I	From 1.1 to 3.7
Unit Test - II	From 4.1 to 5.12

MODEL PAPER Syllabus to be Covered for Unit Tests

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-303
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – THIRD SEMESTER EXAMINATION
EE-303 : POWER SYSTEM –I (GENERATION)

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.
ii. First question carries four marks and remaining each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Tidal Power Plant is a _____ source of energy. **(CO1)**
   (b) State lignite is a coal or not : _____ .**(CO2)**
   (c) Biomass plant is a non-conventional energy source: True / False. **(CO1)**
   (d) Cooling towers are used in _____ power plant. **(CO2)**
2. State the merits of solar power plants. **(CO1)**
3. State the advantages of pulverization of coal in thermal power plants. **(CO2)**
4. State the function of surge tank and spill gates in hydal power plants **(CO3)**
5. State any three factors affecting the selection of site for hydro electric power plant. **(CO3)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain the working of wind power plant. **(CO1)**
   (or)
   (b) Explain the construction of bio-mass power plant. **(CO1)**
7. (a) Explain the working of thermal power plant with line diagram. **(CO2)**
   (or)
   (b) State the factors affecting the selection of site for thermal power plant. **(CO2)**
8. (a) Explain the working of high head hydro electric power plant with block diagram. **(CO3)**
   (or)
   (b) State the advantages and disadvantages of hydro electric power plant. **(CO3)**

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C-20-EE-303

MODEL PAPER – FORMATIVE ASSESMENT-2
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – THIRD SEMESTER EXAMINATION
EE-303 : POWER SYSTEM-I (GENERATION)

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all **five** questions.
ii. First question carries **four** marks and remaining each question carries **three** marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Load factor is defined as the ratio of _____.

   (b) The value of Diversity factor is always _____Unity.

   (c) Splitting of Uranium Nuclei is simply called as Nuclear Fission : **True / False**.

   (d) The rate at which the electrical energy is supplied to the Consumer is called TARIFF : **True / False.(CO4,CO5)**

2. State the merits of Nuclear energy fuels. **(CO4)**

3. List the main controls of Gas turbine . **(CO4)**

4. State the effect of load factor on Cost of Generation. **(CO5)**

5. List the causes of Low power factor. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all **three** questions.
ii. Each question carries **eight** marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain the Use of Moderators in Nuclear Reactors **(CO4)**

   (or)

   (b) Explain the Working of Nuclear Power Plant with block diagram. **(CO4)**

7. (a) Explain the working of Gas Power Station with schematic diagram. **(CO4)**

   (or)

   (b) State the merits and demerits of Gas power stations **(CO4)**

8. (a) A 15MW power station generates 50 x 10^6 units of energy per annum. Determine its load factor. If the load factor is improved to 60%, Calculate the energy generated by the power station. **(CO5)**

   (or)

   (b) Explain the various types of Consumer Power Tariffs in brief. **(CO5)**

***

C-20-EE-303

MODEL PAPER – SUMMATIVE EXAMINATION

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE - THIRD SEMESTER EXAMINATIONS

EE-303 : POWER SYSTEM –I (GENERATION)

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. Answer all questions.
ii. Each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. State any three merits of non-conventional energy sources. **(CO1)**
2. State the need of energy conservation. **(CO1)**
3. State the function of cooling towers in thermal power plants. **(CO2)**
4. List any three advantages of pulverization of coal in thermal power plant. **(CO2)**
5. State different methods of controlling the pollution in thermal power station. **(CO2)**
6. Define nuclear fission and nuclear fusion. **(CO4)**
7. List any three advantages of gas power station. **(CO4)**
8. List any three disadvantages of hydro electric power plant. **(CO3)**
9. State the function of following in hydro electric power plant **(CO3)**

   (a) surge tank (b) spill gates (c) fore bay
10. Define (a) load factor (b) diversity factor **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. Answer all five questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. (a) Explain the working of thermal power plant with line diagram. **(CO2)**

    (or)

    (b) Explain the factors which effect the selection site for thermal power station. **(CO2)**

12. (a) Explain the working of high head hydro electric power plant with line diagram. **(CO3)**

    (or)

    (b) Derive the water power equation in hydro electric power station. **(CO3)**

13. (a) Explain the working of nuclear power plant with block diagram. **(CO4)**

    (or)

    (b) Explain the working of gas power plant with block diagram. **(CO4)**

14. (a) Explain the various types of power tariffs.

(or)

(b) The block rate tariff is as follow
(i) First 50 KWh at Rs.3.00 per KWh
(ii) Next 50 KWh at Rs.2.80 per KWh
(iii) Next 40 KWh at Rs.2.50 per KWh
(iv) Next 30 KWh at Rs.2.20 per KWh
(v) Excess over 170 KWh at Rs.2.00 per KWh
Determine the cost of electrical energy and average unit cost for consuming 200 KWh.**(CO5)**

15. (a) Explain the methods of improving power factor. **(CO5)**

(or)

(b) A three phase synchronous motor having a mechanical load of 100 KW is connected parallel with a load of 500 KW of 0.8 p.f. lagging. The excitation of motor is adjusted, so that the KVA input to the motor becomes 120 KVA. Determine the new power factor of the whole system. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. This question carries ten marks.
ii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

16. With improvement in load factor and diversity factor , cost per unit generation is increased? Is it true . Justify your answer. **(CO5)**

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ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-304	ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS	4	60	20	80

COURSE OUTCOMES MAPPING

S.No	Unit Title	No. of periods	CO's Mapped
1.	Basics of Measuring Instruments	08	CO1
2.	Electromechanical Measuring Instruments	20	CO2
3.	Measurement of Resistance	08	CO3
4	Transducers and Sensors	10	CO4
5.	Electronic & Digital Instruments	14	CO5

COURSE OBJECTIVES	i. To understand the meters used to measure different electrical parameters.
	ii. To know the performance of different electrical and electronic measuring instruments.
	iii. To know the working principle of Transducers and Sensors.

COURSE OUTCOMES	CO1	EE-304.1	Identify various electrical measuring instruments for measuring a given parameter.
	CO2	EE-304.2	Analyse the construction and working of different electrical and electronic measuring instruments.
	CO3	EE-304.3	Explain the measurement of resistance
	CO4	EE-304.4	Select appropriate Transducer for a specific application.
	CO5	EE-304.5	Describe the basic principle of electronic digital measuring instruments

LEARNING OUTCOMES

Basics of measuring instruments.

1.1 Mention the names of the instruments to measure the various electricalquantities.
1.2 Classify the instruments on the basis of their construction and output as analog (electromechanical and analog electronic) and digitalinstruments.
1.3 Classify the electromechanical instruments according to Principle ofWorking.
1.4 Classify the instruments on the basis of method of measuring thevalueasabsolute andsecondaryinstruments.
1.5 Distinguish between Absolute and Secondaryinstruments.
1.6 State the types of secondary instruments (indicating, integrating and recording).by giving suitable examples.
1.7 State the purpose of obtaining deflecting, controlling and damping torques in indicating instruments.
1.8 Explain the methods of obtaining i)deflectingtorqueii)controllingtorqueand iii) damping torque in indicatinginstruments.
1.9 Define the following terms related to measuringInstruments
(i) accuracy (ii)precision (iii) error (iv)resolution (v)sensitivity

Electromechanical Measuring Instruments.

2.1 Describe the construction of Permanent Magnet Moving CoilInstrument.
2.2 Explain the working of Permanent Magnet MovingCoil.
2.3 List the errors commonly occurring in moving coilinstruments and state the remedies for them .
2.4 State the advantages,disadvantages and applications of M.CInstruments.
2.5 Describe the construction and working of Moving Iron (M.I) Instrument.
i)Attractiontype Instrument ii)Repulsion type
2.6 List the errors commonly occurring in M.I. Instruments.
2.7 State the advantages and disadvantages of M.I.Instruments.
2.8 Compare M.C. and M.I.instruments.
2.9 Describe the method of extending the range of moving coilammeter and voltmeter and solve problems.
2.10 Draw the connection diagram for measuring power with wattmeter in a singlephase circuit.
2.11 Explain the construction and working of a dynamometer typeinstrument.
2.12 List the common errors in the DynamometerInstruments.
2.13 List the advantages and disadvantages of dynamometerinstruments.
2.14 State the need for instrument transformers (CT and PT).
2.15 State the precaution to be taken while usingCT.
2.16 Draw the connection diagram for measuring power with wattmeter in single phase circuit inconjunction with instrumenttransformers.
2.17 Explain the construction and working of a 1-phase induction type Energymeter.
2.18 State the common errors and their remedies in 1- phase energymeter.
2.19 Explain the construction and working of Westonsynchroscope.

Measurement of resistance.

3.1 Classify the resistance into Low, Medium and High Values giving examples foreach.
3.2 List the methods of measurementof
(i)Low resistance (ii)Medium resistance and (iii) Highresistance

3.3 Draw the circuit diagram of basicOhm-meter.
3.4 Explain the working of basicOhm-meter.
3.5 Describe the two types of Ohm-meters (series andshunt).
3.6 Describe the construction and working ofMegger.
3.7 State the working principle of basicPotentiometer.
3.8 Describe the construction and working of basic Potentiometer with a legiblesketch.
3.9 Explain the measurement of unknown resistance usingPotentiometer.
3.10 List the applications ofPotentiometer.

Transducers and Sensors

4.1 DefineTransducer.
4.2 State the need of Transducers in Measurementsystems
4.3 ClassifyTransducers
(i)based on the principle of transduction formused
(ii) as PrimaryandSecondary(iii) as Passive andActive
(iv) as AnalogandDigital (v) as Transducers and InverseTransducers
4.4 Explain the factors influencing the choice ofTransducer
4.5 State the applications ofTransducers.
4.6 Explain the use of Thermocouple for the measurement oftemperature.
4.7 Explain the measurement of temperature using Thermister in a bridgecircuit.
4.8 State the working principle of straingauge.
4.9 Describe the construction of Linear Variable Differential transformer(LVDT).
4.10 Explain the working ofLVDT.
4.11 State the advantages and Disadvantages ofLVDTs.
4.12 Define Sensor and list its types.
4.13 List the applications ofsensors.
4.14 Explain the working of Hall effect.

Electronic & Digital instruments

5.1 List analog electronic Instruments
5.2 List the basic components of analog electronicInstruments.
5.3 Explain the working of Rectifier type voltmeter andammeter.
5.4 List the basic components of Digitalinstruments.
5.5 List the advantages of Digital Instruments over AnalogInstruments.
5.6 List the types of digitalvoltmeters.
5.7 Explain the Working of Digital Multimeter with block diagram.
5.8 Explain the Working of Single Phase Digital Energy meter with blockdiagram.
5.9 Explain the Working of Three Phase Digital Energy meter with blockdiagram.
5.10 Explain the Working of Digital frequency meter with blockdiagram.

CO-PO/PSO MATRIX:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-304.1	3	2		1				3		
EE-304.2	2							3		
EE-304.3	2	2						3		
EE-304.4	2		2					3	2	
EE-304.5	2			2				3		
Average	**2.2**	**2**	**2**	**1.5**				**3**	**2**	

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Basics of Measuring instruments:
List of important electrical quantities to be measured, their units and the names of the instruments to measure them- Classification of instruments - different types of torques (Deflection, Controlling and Damping torques) in the indicating instruments-definitions of accuracy, precision, error, resolution and sensitivity.

Electromechanical Measuring Instruments:
M.C. and M.I types of Ammeters and Voltmeters - their Construction and working, errors, comparison- shunts and multipliers for M.C instruments – problems on shunts and multipliers forM.C instruments - Dynamometer type Ammeter, Voltmeter and Wattmeter –construction, working, errors - use of Instrument transformers- Measurement of energy –single phase Induction type energy meter- Construction and working, error and adjustments construction and connections of a 3-phase energy meter- Construction and working of WestonSynchroscope.

Measurement of resistance:
Classification of resistance- List of methods of measurement of resistance- explanation of basic Ohm meter circuit – difference in series and shunt type ohmmeters- Construction and working of meggerworking principle, construction and applications ofPotentiometer.

Transducers and Sensors:
Definition of transducer-need of transducer - Classification of Transducers - Factors influencing while its selection -Applications of Transducers –Thermocouple- Thermister - working principle and use of Strain Gauge- construction, working and use of LVDT- Basic Concept of Sensors and its applications –Semiconductorsensors.

Electronic & Digital Instruments:
Basic components of analog electronic Instruments - Working of Rectifier type Voltmeter and Ammeter- basic components of Digital (Digital electronic) instruments- advantages of Digital Instruments over Analog Instruments- types of digital Voltmeters- specifications of digital voltmeter- working of digital multi meter and its specifications- working of single phase digital energy meter with block diagram-- working of three phase digital energy meter with block diagram- Working of Digital frequency meter with block diagram.

BLUE PRINT:

S.No	Unit Title	No. of period s	Weightage Allocated		Markswise Distribution of Weightage				Questionwise Distribution of Weightage				CO's Mapped
					R	U	Ap	An	R	U	Ap	An	
1	Basics of Measuring Instruments	8	11		0	3	8		0	1	1		CO1
2	Electromechanical Measuring Instruments	20	20	*	6	8	6	*	2	1	2	*	CO2
3	Measurement of Resistance	8	11		3	8	0		1	1	0		CO3
4	Transducers and Sensors	10	14	*	3	8	3	*	1	1	1	*	CO4
5	Electronic & Digital Instruments	14	14		8	3	3		1	1	1		CO5
	Total	**60**	**70**	**10***	**20**	**30**	**20**	**10***	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 2.19
Unit Test-II	From 3.1 to 5.10

REFERENCE BOOKS

1. A. K.SAWHNEY - Electrical and Electronic measuring instruments –- Dhanpat Rai &Sons.
2. E.W. Golding and F.C. Widdis,Electrical Measurements and measuring instruments–Whily publishers.
3. R.S.Khandpur -Modern ElectronicEquipment
4. K.B.Bhatia -Study of Electrical Appliances and Devices – KhannaPublishers.
5. J.B.Gupta-Electrical measurements and measuring Instruments-KATSON Books
6. Er.R.K.Rajput -Electrical measurements and measuring Instruments-S.Chand

MODEL PAPER – FORMATIVE ASSESMENT-1

C-20-EE-304

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – THIRD SEMESTER EXAMINATION

EE-304 : ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.

ii. First question carries four marks and remaining each question carries three marks.

iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) The torque required to operate the indicating instrument is called _____ torque.
   (b) The spring in measuring instrument is made of which material.
   (c) The repulsion type instrument is moving coil instrument. (True/False).
   (d) The shape of the disc in induction type energy meter is _____. **(CO1, CO2)**
2. Distinguish between absolute and secondary instruments in any three aspects. **(CO1)**
3. State any three applications of moving coil instruments. **(CO2)**
4. State any three advantages of dynamometer instruments. **(CO2)**
5. List common errors occurring in single phase induction type energy meter. **(CO2)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.

ii. Each question carries eight marks.

iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain method of obtaining controlling torque by gravity control with legible sketches. **(CO1)**

   (OR)

   (b) Explain method of obtaining damping torque by air friction damping with legible sketch. **(CO1)**

7. (a) Explain the construction of permanent magnet moving coil instrument with legible sketch. **(CO2)**

   (OR)

   (b) Explain the working of Attraction type moving iron instrument with legible sketch.**(CO2)**

8. (a) Explain the working of Weston synchroscope with legible sketch. **(CO2)**

   (OR)

   (b) A PMMC instrument gives a reading of 25 mA when the potential difference across its terminals is 75 mV. Calculate the shunt resistance for full scale deflection corresponding to 50A. **(CO2)**

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C-20-EE-304

MODEL PAPER – FORMATIVE ASSESMENT-2

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – THIRD SEMESTER EXAMINATION

EE-304 : ELECTRICAL & ELECTRONIC MEASURING INSTRUMENTS

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all **five** questions.
ii. First question carries **four** marks and remaining each question carries **three** marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Transducer is a device which converts _____.

   (b) Potentiometer measures _____.

   (c) Digital Multimeter measures Insulation resistance : **True / False**.

   (d) Single Phase Energy Meter records the Maximum Value of Current that occurred in a month: **True / False.** **(CO3,CO4,CO5)**

2. List the applications of Potentiometer. **(CO3)**

3. State any three applications of Transducers. **(CO4)**

4. Define sensor and state any two of its applications. **(CO4)**

5. List the advantages of Digital Instruments over Analog Instruments. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all **three** questions.
ii. Each question carries **eight** marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain the working of Basic Ohm-meter **(CO3)**

   (or)

   (b) Explain the Working of Megger with block diagram. **(CO3)**

7. (a) Explain the use of thermo couple for the measurement of Temperature. **(CO4)**

   (or)

   (b) State the merits and demerits of LVDT. **(CO4)**

8. (a) Explain the working of Rectifier type Voltmeter. **(CO5)**

   (or)

   (b) Explain the working of Digital frequency meter with block diagram. **(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION

C-20-EE-304

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – THIRD SEMESTER EXAMINATION

EE-304 : ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. Answer all questions.

ii. Each question carries three marks.

iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. Distinguish between absolute and secondary instruments in any three aspects. **(CO1)**
2. List any three advantages of Moving Coil measuring instruments. **(CO2)**
3. State any three applications of Moving Coil instruments. **(CO2)**
4. List the errors commonly occurring in Moving Iron instruments. **(CO2)**
5. State the need for instrument transformers. **(CO2)**
6. Draw the circuit diagram of basic ohm-meter. **(CO3)**
7. State the working principle of strain gauge. **(CO4)**
8. State the need of transducers in measurement system. **(CO4)**
9. List any six basic components of analog electronics instruments. **(CO5)**
10. List the types of digital voltmeters. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. Answer all five questions.

ii. Each question carries eight marks.

iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. (a) Explain method of obtaining controlling torque by spring control with a legible sketch. **(CO1)**

(OR)

(b) Explain eddy current damping with a legible sketch. **(CO1)**

12. (a) Describe the construction of Attraction type moving iron instrument with a legible sketch. **(CO2)**

(OR)

(b) Explain the working of single phase induction type energy meter with a legible sketch. **(CO2)**

13. (a) Explain the working of Megger with a legible sketch. **(CO3)**

(OR)

(b) Explain the construction of basic potentiometer with a legible sketch. **(CO3)**

14. (a) Explain the working of LVDT with a legible sketch. **(CO4)**

(OR)

(b) Explain the working of strain gauge with a legible sketch. **(CO4)**

15. (a) Explain the working of digital frequency meter with a block diagram. **(CO5)**

(OR)

(b) Explain the digital multimeter with a block diagram. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. This question carries ten marks.

ii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

16. A pmmc instrument is having a full deflection of 10A.when it is used in a circuit to measure current, itindicates only zero value. What might be the possible reasons? **(CO2)**

***

ELECTRICAL CIRCUITS

Course code	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-305	ELECTRICAL CIRCUITS	4	60	20	80

S. No.	Unit Title	No. of Periods	CO'S Mapped
1.	D.C Circuits	12	CO1
2	Network Theorems	10	CO2
3	Fundamental of A.C.	8	C03
4	Single phase A.C Circuits	20	CO4
5	Poly phase circuits	10	CO5
Total		60	

Course objectives:

Course Objectives	i. To solve electrical circuits by KVL, KCL and various Network theorems. ii. To acquire knowledge on A.C circuits and its components and to solve them. iii. To understand poly phasecircuits and solve problems

Course outcomes:

Course outcomes	**CO1**	EE-305.1	Explain various laws and Star/Delta transformation.
	CO2	EE-305.2	Analyseelectrical circuits using various network theorems.
	CO3	EE-305.3	Analyse for different A.C quantities employing j-notation.
	CO4	EE-305.4	Solve for resonance in series and parallel R, L, C circuits
	CO5	EE-305.5	Solve problems in poly phase circuits.

Learning outcomes:

D.CCircuits

1.1 Differentiate between active and passivecircuits.
1.2 Define junction, branch and loop incircuits
1.3 State (i)Kirchhoff'scurrentlaw(KCL) (ii)Kirchhoff's voltagelaw.(KVL)
1.4 Solve problems by applying KVL andKCL
1.5 Explain star and deltacircuits
1.6 Explain the concept of circuit transformation and equivalentcircuits
1.7 Develop transformation formulae for star- delta transformations andvice-versa
1.8 Solve problems on Star Delta Transformation.

NetworkTheorems

2.1 Explain ideal voltage source & ideal currentsource
2.2 Explain Source transformationtechnique
2.3 State Super positiontheorem.
2.4 State Thevenin'stheorem.
2.5 State Norton'stheorem
2.6 State Maximum power transfer theorem. (All the theorems with reference to D.Conly)
2.7 Solve problems on the abovetheorms

Fundamentals ofA.C

3.1 State the relation between poles, speed andfrequency
3.2 Define the instantaneous value, maximum value, frequency, time period, Averagevalue, R.M.S value, Form factor and Peak factor of an A.C quantity.
3.3 Derive the above for different alternating waveforms viz. half wave, full waverectified sine wave, triangular wave and square waveforms.
3.4 Explain the terms phase and phase difference of an A.Cquantity.
3.5 Understand joperator
3.6 Convert polar quantities into rectangular quantities andVice-versa.

Single-phase A.C circuits

4.1 Derive relationship between voltage and current ina
(i) Pureresistivecircuit ii) Pureinductive circuitiii) Pure capacitivecircuit.
4.2 Calculate the impedance, current, phase angle, power and power factor in R-L series circuits, R-C series circuits, L-C series circuits, R-L-C seriescircuits.
4.3 Solve Problems on SeriesCircuits
4.4 Define Resonance and Derive a formula for resonant frequency of a R-L-C seriescircuit.
4.5 Define Q-factor and state its importance,
4.6 Solve problems on SeriesResonance.
4.7 Explain the following methods for solving two branch parallel A.C circuits.
(i)Vectormethod (ii) Admittancemethod (iii) J- notationmethod
4.8 Solve Problems on Vector method and j-notation method for two branch parallel A.C circuits.

Poly PhaseCircuits

5.1 Definetheterm`PolyPhase'.
5.2 List advantages of 3 phase system over single phasesystem.
5.3 Write the expressions for three-phase emfs and represent them by phasordiagram.
5.4 State the concept of phasesequence.
5.5 Derive the relation between line and phase values of current and voltage in 3phase
(i)Starcircuits and (ii)delta circuits.
5.6 Derive the equation for power in 3 phasecircuit.
5.7 Solve numerical examples in balancedloads.
5.8 Derive the formulae for measurement of 3 phase power and power factor by using two wattmeters.
5.9 Solve simple problems on two wattmeter method.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-305.1	3		1					3		
EE-305.2	3	2						3		
EE-305.3	3	2	1					3		
EE-305.4	3		1					3		
EE-305.5	3		1					3		
Average	3	2	1					3		

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

COURSE CONTENT

D.CCircuits
ActiveandPassivecircuits-Junction,branchandloopincircuits-Kirchoff'slaws-Star-Deltaconfigurations,star-deltatransformations.

NetworkTheorems
Ideal Voltage source , Ideal current source - Source transformation technique- Super position theorem- Thevenin's Theorem -Norton's Theorem- Maximum power transfer theorem with reference to D.C.-Problems on the above.

Fundamentals ofA.C.
Relation between poles, speed and frequency**-** Definition of Alternating quantity, cycle, period, frequency, amplitude, instantaneous value and angular velocity **-** Average value - effective value/R.M.S value definitions and derivations - calculations of these values for half wave rectified sine wave, full wave rectified Sine wave, Triangular and Square wave forms-form factor-peak factor **-** Representation of alternating quantities by equation, graphs and phasor diagrams **-** Phase and phase difference **–** Understanding of `J' notation for alternating quantities ,transformation from polar to rectangular notations andVice-versa

Single phase A.C. Circuits
Concept of reactance, purely inductive and purely capacitive circuits - Derivation of voltage , current, power relations including phase relationships, wave forms and phasor diagrams **-** R-L, R-C , L-C & R-L-C series circuits - Derivation of relation between voltage, current, impedance, power including wave forms and phasor diagrams. Impedance triangle, phase angle, power factor, active and reactive components of current and power in above circuits – Definition of Resonance in series circuits and expression for resonant frequency- Q-factor-Importance of Q-factor- Problems on series circuits and seriesresonance - Simple Parallel circuits - solution by vector method and by `J' notation – problems.

Poly phasecircuits

Definition of Poly phase - Advantages of poly-phase systems over single-phasesystems - Location of coils for obtaining required phase difference - Representation of 2 phase,3 phase EMF by equations, graphs and phasors - phase sequence **-** Current in neutral in 2 phase and 3 phase system - Method ofconnection of star and delta - phasor diagram showing relation between phase and line quantities, Relation between phase and Line values of voltages and currents -power equation - Problems on 3 phase balanced circuits – Measurement of 3 phase power by two wattmeter and power factor in balanced circuits - Effect of Load power factor on wattmeter readings – Problems.

REFERENCE BOOKS

1. B.L. Theraja -Electrical Technology - Vol – I,S.Chand&co.
2. V. K .Mehta-Introduction to ElectricalEngineering-S Chand.
3. Parker Smith -Problems in ElectricalEngineering.
4. Abhijit Chakrabarthi-"CircuitTheory Analysis and synthesis"- Dhanapat Rai and co.
5. A.Sudhakar and Shyammohan S Palli,"Circuits and network analysis and synthesis"-Tata McGraw-Hill,5th edition.
6. B.Subramanyam-Electric Circuit analysis-I K International publishing House Pvt.Ltd.

Blue print:

S.No.	Unit title	No. of periods	Weightage allocated		Marks wise distribution of weightage				Question wise distribution of weightage				CO'S Mapped
					R	U	Ap	An	R	U	Ap	An	
1.	D.C Circuits	12	14		3	3	8		1	1	1		CO1
2	Network Theorems	10	11	*	3	0	8	*	1	0	1	*	CO2
3	Fundamentals of A.C.	8	9	*	3	3	3	*	1	1	1	*	C03
4	Single-phase A.C series circuits	20	25	*	6	3	16	*	2	1	2	*	CO4
5	Polyphase circuits	10	11	*	3	0	8	*	1	0	1	*	CO5
Total		**60**	**70**	**10***	**18**	**9**	**43**	**10***	**6**	**3**	**6**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model Papers:Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.6
Unit Test-II	From 4.1 to 5.9

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-305
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – THIRD SEMESTER EXAMINATION
EE-305 : ELECTRICAL CIRCUITS

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) What is the full form of KVL related to D.C. Circuits.

   (b) The Thevinin's theorem can be applied to D.C. and A.C networks. (True/false).

   (c) If instantaneous voltage e=100Sin (50t), its RMS value is _____.

   (d) The polar form of 3+j4 is _____. **(CO1, CO2, CO3)**

2. Define (a) junction (b) branch (c) loop. **(CO1)**

3. State superposition theorem. **(CO2)**

4. Define ideal voltage source and ideal current source. **(CO2)**

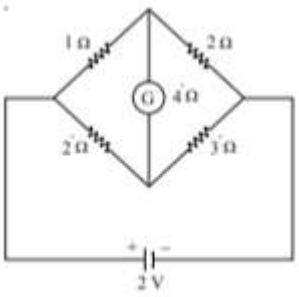
5. Define (a) frequency (b) Form Factor related to A.C. quantity. **(CO3)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

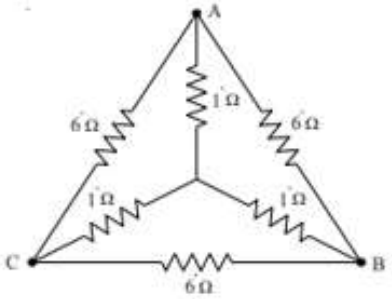
6. (a) Find the current through each resistor in circuit shown in Fig. using Kirchhoff's laws. **(CO1)**



FIG

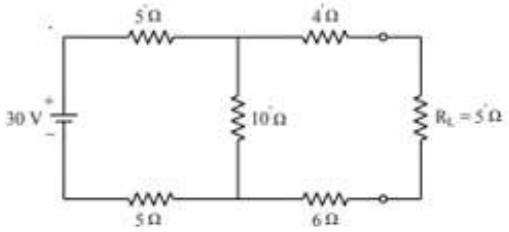
(OR)

(b) A network of resistances is shown in Fig. Find the equivalent resistance measured between (i) A and B (ii) B and C and (iii) C and A using star/Delta transformation. **(CO1)**



FIG

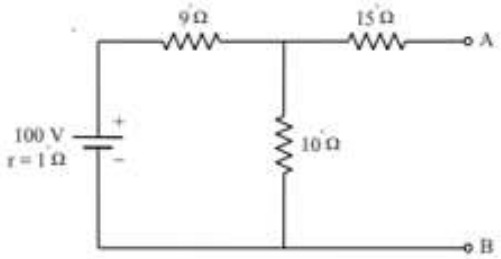
7. (a) In the network shown in Fig. Calculate the current through load resistance R_L by using Norton's theorem. **(CO2)**



FIG

(OR)

(b) Find the value of load resistance to be connected across terminals A and B to get maximum power delivered in the circuit shown in Fig. **(CO2)**



FIG

8. (a) Derive an expression for RMS value and maximum value for full wave rectifier sine wave. **(CO3)**

(OR)

(b) Perform the following where A = 6 + j8, B = 8 – j10

(i) A + B (ii) A – B (iii) A× B (iv) A ÷ B **(CO3)**

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UNIT TEST II - MODEL PAPER – FORMATIVE ASSESMENT-2

C-20-EE - 305

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – THIRD SEMESTER EXAMINATION

EE-305 : ELECTRICAL CIRCUITS

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.
ii. First question carries four marks and remaining each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a)The relation between voltage and current in a pure inductance is _____.
   (b) Write the formula for resonance frequency of a RLC series circuit.
   (c) The phase angle between any two phases in a three phase system is 120 degrees. True / False.
   (d) In a star connection the phase voltage is ____ times the live voltage.
2. Define resonance of a RLC series circuit. **(CO4)**
3. Define Q-factor of a RLC series circuit. **(CO4)**
4. List any three advantages of 3 phase system over single phasesystem. **(CO5)**
5. State the concept of phase sequence. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) A pure inductive coil allows a current of 10 Amp to flow from a 230 volt, 50 Hz supply. Find (i) Inductive reactance (ii). Inductance of the coil. (iii) powerabsorbed. **(CO4)**

   (or)

   (b) A capacitor of 125 μ F is connected to an alternating source of 200 sin 314 t. Find the current flowing and current equation. **(CO4)**

7. (a) Find total impedance, line current, voltage across each and power factor for a series circuit, consisting of a coil of inductance 0.1 H, resistance 8 Ω and a capacitance of 120 μ F connected to a 250 V, 50 Hz supply. **(CO4)**

   (or)

   (b) Find the resonance frequency of RLC series circuit having resistance 10 Ω, inductance 20 mH and capacitance 100 μF. Also find the current at resonance, and voltage across the resistor. **(CO4)**

8. (a) Three equal impedances each of 8 + j 6 Ω are connected in star This is further connected to a 400v, 50Hz, 3-phse supply calculate active and Reactive power and line and phase currents. **(CO5)**

   (or)

   (b) Two wattmeters, when connected to a 3– ϕ , 400V, 50Hz motor shown a total load of 20 KW. The power factor is 0.45 lag. What is the reading of each wattmeter. **(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-305
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – THIRD SEMESTER EXAMINATION
EE-305 : ELECTRICAL CIRCUITS

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

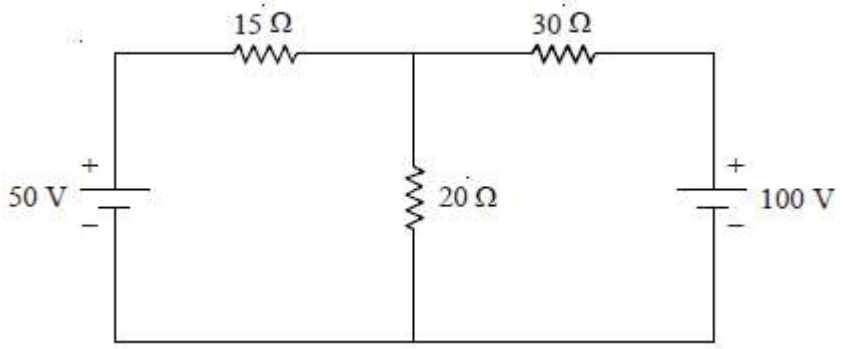
1. Define (i) Junction (ii) Branch (iii) Loop related to electrical circuits. **(CO1)**
2. Three resistances 20Ω, 80Ω and 30Ω are connected in Delta. Find the equivalent resistances in Star. **(CO1)**
3. State superposition theorem. **(CO2)**
4. State the relation between number of poles, speed and frequency. **(CO3)**
5. Define the terms related to A.C. quantity (i) RMS value and (ii) peak factor. **(CO3)**
6. The given two vectors are A=30+j52 and B= 30-j52. Perform the functions **(CO3)**
   (i). A+B (ii) A x B
7. Define resonance of series circuit and state the formula for resonance frequency. **(CO4)**
8. A resistance of 4Ω is connected in series with an inductance of 0.02H across the supply of 200V, 50Hz. Find current in the circuit. **(CO4)**
9. Define Q-factor and state its importance. **(CO4)**
10. List any three advantages of 3-phase system over single phase system. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

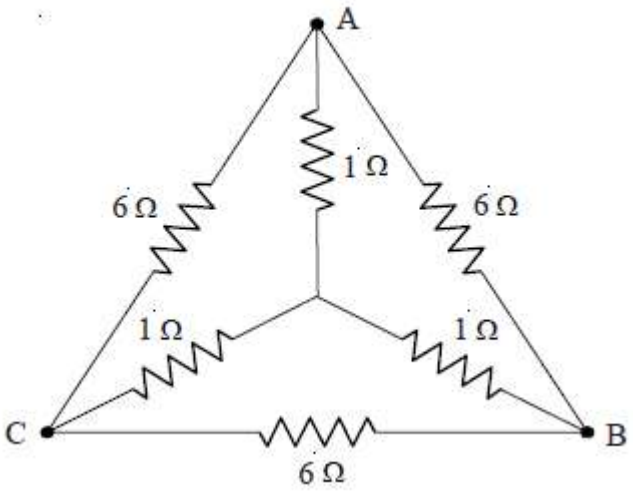
11. (a) Using Kirchhoff's laws, find the current in all resistors in the circuit shown in Fig. **(CO1)**



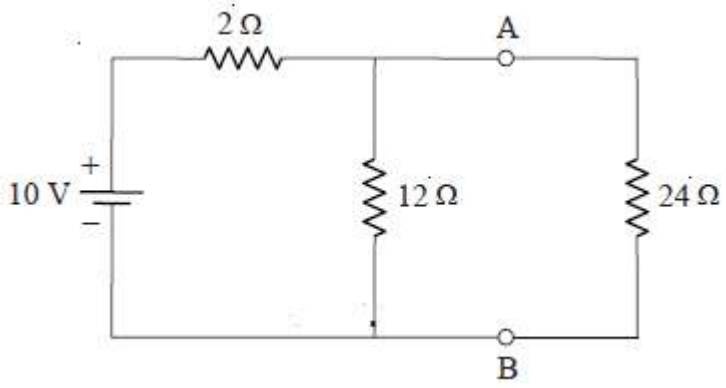
(OR)

(b) A network of resistances is shown in Fig. Find the equivalent resistance measured between (i) A and B (ii) B and C (iii) C and A using Star/Delta transformation.

(CO1)

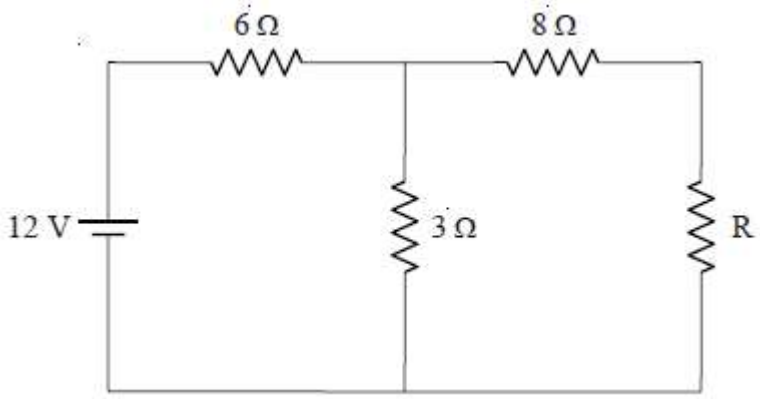


12. (a) Find the current through 4Ω resistor in the network shown in Fig. by using Thevenin's theorem. **(CO2)**



(OR)

(b) For the circuit shown in Fig. determine the value of R for maximum power to R and also calculate the power delivered under the given condition. **(CO2)**



13. (a) A voltage of 125 volt at 60 Hz is applied across a non-inductance resistor connected in series with a condenser. The current in the circuit is 2.2 ampere. The power loss in the resistor is 96.8 watt and that in the condenser is negligible. Calculate resistance and capacitance. **(CO4)**

(OR)

(b) A resistance of 50Ω, inductance of 100 mH and a capacitance of 100 µF are connected in series across 200volt, 50Hz supply. Determine (i) Impedance (ii) current flowing through the circuit (iii) power factor (iv) power in watts. **(CO4)**

14. (a) A coil having a resistance of 20Ω and an inductance of 0.14 H is connected in parallel with a capacitor of 60 µF, which is in series with a resistor of 25Ω. Calculate the total current and phase angle when this combination is connected across 200V, 50 Hz supply. **(CO4)**

(OR)

(b) A series RL circuit has a resistance of 25Ω and inductive reactance of 32Ω. It is connected in parallel to a capacitor of 100 µF and the combination is connected across a 200V, 50 Hz supply. Find the current in each branch. Draw the vector diagram showing the total current. (**CO4)**

15. (a) A balanced star connected load of (4+j3) Ω per phase is connected to a balanced 3-phase 400V supply. The phase current is 12A. Find (i) Total active power (ii) reactive power and (iii) Total apparent power. **(CO5)**

(OR)

(b) Each phase of delta connected load comprises a resistor of 60Ω and capacitance of 40 µF in series. Calculate line and phase currents, total power when the load is connected to a 440V, 3-phae, 50Hz supply. **(CO5)**

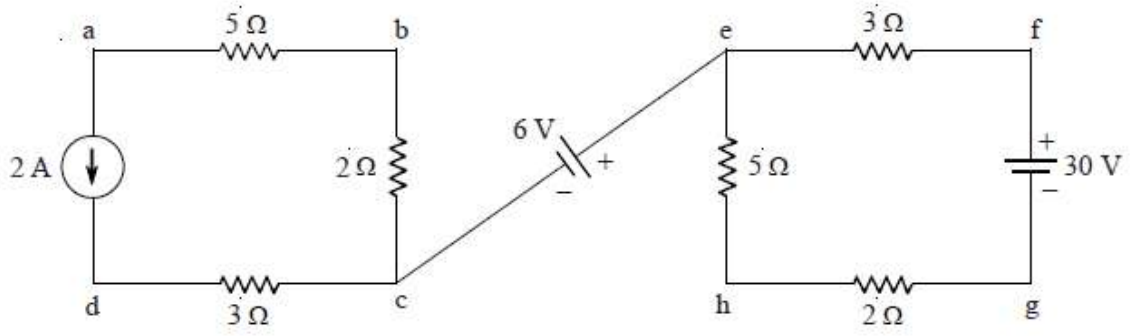
PART-C **1 x 10 = 10**

Instructions:

i. This question carries ten marks.

ii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

16. In the circuit given below ,how much increament in voltage across terminals b and h can be observerd , if current source is replaced with 10V voltage source. **(CO2)**



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PROGRAMMING IN C

Course Code	Course Title	No. of periods / Week	Total No.of Periods	Marks for FA	Marks for SA
EE-306	PROGRAMMING IN C	4	60	20	80

COURSE OUTCOMES MAPPING

S.No	Unit Title	No. of periods	CO's Mapped
1.	Basics of 'C' Programming	10	C01
2.	Decision & Loop Control Statements	10	CO2
3.	Arrays& Strings	13	C03
4	User defined Functions	13	C04
5.	Structures , Unions & Pointers	14	CO5
	Total	**60**	

COURSE OBJECTIVES	i. To impart adequate knowledge on the need of programming languages andproblem solving techniques.
	ii. To develop programming skills using the fundamentals and basics of C-Language.
	iii. To enable effective usage of arrays, structures, functions, pointers and toimplement the memory management concepts.

COURSE OUTCOMES	CO1	EE-306.1	Develop C programs using operators with proper flow chart and algorithm.
	CO2	EE-306.2	Apply conditional and iterative statements to write C programs.
	CO3	EE-306.3	DevelopC programs on arrays and strings.
	CO4	EE-306.4	Develop modular programming using functions.
	CO5	EE-306.5	Write programmes using structures, unions and pointers.

LEARNING OUTCOMES

Basics of 'C' Programming

1.1 StatetheImportanceof'C'
1.2 Explainthebasicstructureof'C'Programming
1.3 Know the Programming style with sampleprogram
1.4 Execute a 'C'Program
1.5 Know about the characterset
1.6 Know about constants, variables, keywords &identifiers
1.7 List various data types withexamples
1.8 Explain different arithmetic operators, relational operators and logical operators with their precedence
1.9 Explain the assignmentstatements
1.10 Explain the increment & decrementoperators
1.11 Identify the compound Assignmentoperators
1.12 Explain the I/P functions printf andscanf
1.13 Know various type conversiontechniques

Decision & Loop Control Statements

2.1 State the Importance of conditionalexpressions
2.2 List and explain the various conditionalstatements
2.3 Explain the switchstatement
2.4 List the different iterative loops and explain them(for, do, whilestatements)
2.5 Define nesting and implement with simpleprograms
2.6 Differentiate'break'and'continue'statementswithprograms
2.7 Mention about the null statements and commaoperator

Arrays & Strings

3.1 Define 1-D and 2-DArrays.
3.2 Know how to initialize above arrays and access arrayelements
3.3 Explain simple programs usingarrays
3.4 Define'string'
3.5 Know how to declare and initialize stringvariables
3.6 Understand various string handlingfunctions
3.7 Implement programs using stringfunctions

User defined functions

4.1 Define'function'
4.2 Understand the need for User definedfunction
4.3 Know the return values and theirtypes
4.4 Write programs using function calltechnique
4.5 List the four storage classes supported byC
4.6 Discuss the importance of function proto types inprogramming
4.7 Differentiate local and externalvariables
4.8 Identify automaticandstaticvariables and discuss them indetail
4.9 Write simple programs onabove

Structures, Unions & Pointers

5.1 Define astructure
5.2 Describe about structurevariable
5.3 Explain initialization ofstructures

5.4 Know the accessing of members of astructure.

5.5 Illustrate concept of structureassignment

5.6 Explain how to find size of astructure.

5.7 Know passing of individual members of a structure to afunction

5.8 Define Union and Illustrate use ofunion

5.9 Declare pointer, assign pointer, and initializepointer

5.10 Discuss pointerarithmetic.

5.11 Illustrate with example how pointer can be used to realize the effect of parameter passing byreference.

5.12 Illustrate with examples the relationship between arrays andpointers.

5.13 List various conditional and unconditional preprocessordirectives

CO-PO/PSO MATRIX:

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-306.1	3							3		
EE-306.2	3							3		
EE-306.3	3							3		
EE-306.4	3	1	1					3	1	
EE-306.5	3	1	1	1				3	1	1
Average	**3**	**1**	**1**	**1**				**3**	**1**	**1**

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note : 1. This Subject is to be taught by Computer Engg. faculty

2. Paper setting and paper evaluation is also to be done by Computer Engg Faculty.

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Basics of 'C'Programming

Structure of a C program, Programming rules, Character Set Keywords, Constants, Variables, Data types, Type conversion, Arithmetic, Logical, Relational operators and precedences – Assignment, Increment, Decrement operators, evaluation of expressions. I/P functions

Decision and Loop controlStatements

If, If-else, Nested If else, Break, Continue and Switch statements Loops:- For, While, Do-while, Nesting of Loops- Null statement..

Arrays andStrings

1 D Array declaration, Initialization, 2 D Array declaration, Initialization, Accessing of Array elements, Character Arrays declaration and Initialization of Strings, string handling functions

User definedFunctions

Function-Definition, Declaration, Return statement, passing parameters to function- Function calls, Storage classes of variables, Scope and visibility.

Structures, Unions &Pointers

Structure features, Declaration and Initialization, Accessing of Structure members, Unions. Pointer declaration, Arithmetic operations and pointers, Pointers and Arrays, Various Preprocessordirectives.

REFERENCE BOOKS

1. Yashwant Kanetkar–"Let us learn C"- BPB Publication, NewDelhi
2. Balaguru Swamy –"Programming in ANSI C"-TMH, III Edition
3. Byron Gottfried-Programming In C –Schaum Series
4. Reema Thareja-Programming in C - Oxford universitypress.
5. Brain W, Kernighan and DennisM . Ritchie-C Programming Language-pearson

BLUE PRINT

S. No	Unit Title	No. of periods	Weightage Allocated		Markswise Distribution of Weightage				Questionwise Distribution of Weightage				CO's Mapped
					R	U	Ap	An	R	U	Ap	An	
1	Basics of 'C' Programming	10	14		3	3	8		1	1	1		C01
2	Decision & Loop Control	10	14	*	3	3	8	*	1	1	1	*	CO2
3	Arrays& Strings	13	14	*	3	3	8	*	1	1	1	*	C03
4	User defined Functions	13	14	*	3	3	8	*	1	1	1	*	C04
5	Structures , Unions & Pointers	14	14	*	3	3	8	*	1	1	1	*	CO5
	Total	**60**	**70**	**10***	**15**	**15**	**40**	**10***	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model Papers: Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.7
Unit Test-II	From 4.1 to 5.10

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-306
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – THIRD SEMESTER EXAMINATION
EE-306 : PROGRAMMING IN C

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) Keyword for Decimal Number data type in C _____ .

   (b) Logical AND operation is denoted by _____ .

   (c) The instruction a += 2; represents _____ .

   (d) An array contains 10 elements. The index of last element is 10 : True / False **(CO1)**

2. List any six data types supported by C. **(CO1)**

3. State the importance of conditional expressions in a C program. **(CO2)**

4. Differentiate 'break' and 'continue' statements. **(CO2)**

5. What is Array and how do access the elements of it? **(CO3)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Explain different arithmetic, relational and logical operators with their precedence in C programming. **(CO1)**

   (OR)

   (b) Explain the assignment statement, increment and decrement operators in C programming. **(CO1)**

7. (a) Explain the working of various conditional statements available in C. **(CO2)**

   (OR)

   (b) Explain the working of various iterative loops available in C. **(CO2)**

8. (a) Write a C program to find the biggest number in a given array of numbers. **(CO3)**

   (OR)

   (b) Write a C program using any four String Handling functions. **(CO3)**

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MODEL PAPER – FORMATIVE ASSESMENT-2
C-20-EE-306
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – THIRD SEMESTER EXAMINATION
EE-306 : PROGRAMMING IN C

Time: 90 Minutes Total Marks: 40

PART-A (1 x 4) + (4 x 3) = 16

Instructions:

i. Answer all five questions.
ii. First question carries four marks and remaining each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) A function calling itself is called as recursion : True / False. **(CO4)**

   (b) A pointer is _____ . **(CO5)**

   (c) The operator used to get value at address stored in a pointer variable is ____ **(CO5)**

   (d) (void*)0 represents _____ **(CO5)**

2. What is the need of User Defined Function in programming? **(CO4)**
3. List the four storage classes supported by C. **(CO4)**
4. Define Structure and give an example to it. **(CO5)**
5. List any six conditional preprocessor directives available in C. **(CO5)**

PART-B 3 X 8 = 24

Instructions:

i. Answer all three questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Write a C program using an User Define Function returning a value to the main function. **(CO4)**

   (OR)

   (b) Write a C program using Local and External variables. **(CO4)**

7. (a) Explain how to find the Size of a Structure in C, with an example. **(CO5)**

   (OR)

   (b) Explain how a pointer can be used to realize the effect of parameter passing by reference in C, with an example. **(CO5)**

8. (a) Define Union and illustrate the use of Unions in C programming. **(CO5)**

   (OR)

   (b) Write a C program to handle the student records using structures. **(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-306
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE - THIRD SEMESTER EXAMINATIONS
EE-306 : PROGRAMMING IN C

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. Write the basic structure of a C program. **(CO1)**

2. List any six data types supported by C. **(CO1)**

3. State the importance of conditional expressions in a C program. **(CO2)**

4. Differentiate 'break' and 'continue' statements. **(CO2)**

5. What is Array and how do access the elements of it? **(CO3)**

6. What is the operation of 'strcmp' function? **(CO3)**

7. What is the need of User Defined Function in programming? **(CO4)**

8. List the four storage classes supported by C. **(CO4)**

9. Define Structure and give an example to it. **(CO5)**

10. List any six conditional preprocessor directives available in C. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) Explain different arithmetic, relational and logical operators with their precedence in C programming. **(CO1)**

(OR)

(b) Explain the assignment statement, increment and decrement operators in C programming. **(CO1)**

12. (a) Explain the working of various conditional statements available in C. **(CO2)**

(OR)

(b) Explain the working of various iterative loops available in C. **(CO2)**

13. (a) Write a C program to find the biggest number in a given array of numbers. **(CO3)**

(OR)

(b) Write a C program using any four String Handling functions. **(CO3)**

14. (a) Write a C program using an User Define Function returning a value to the main function. **(CO4)**

(OR)

(b) Write a C program using Local and External variables. **(CO4)**

15. (a) Explain how to find the Size of a Structure in C, with an example. **(CO5)**

(OR)

(b) Explain how a pointer can be used to realize the effect of parameter passing by reference in C, with an example. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**

ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. Write a C program to print the Fibonacci Seriesof ten numbers using Recursive function.**(CO3)**

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ELECTRICAL ENGINEERING DRAWING - I

Course code	Course title	No.of periods / week	Total no. of periods	Marks for FA	Marks for SA
EE-307	Electrical Engineering Drawing - I	6	90	40	60

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Graphical symbols, views of fuses and couplings, Measuring instruments and Guarding systems	18	CO1
2	D.C. Machines and Starters	30	CO2
3	D.C. Windings	18	CO3
4	Earthing Systems	12	CO4
5	Supporting structures	12	CO5
TOTAL		**90**	

Course Objectives	(i) To familiarise with the different electricalsymbols (ii) To draw the views of D.C. machine and D.C.windings (iii) To understand different earthing systems and supporting structures.

Course outcomes	**CO1**	**EE-307.1**	Use different types of symbols, fuses, couplings, measuring instruments and gaurding system in electrical drawing.
	CO2	**EE-307.2**	Draw different views of DC machine and starters.
	CO3	**EE-307.3**	Draw the different types of DC machine windings.
	CO4	**EE-307.4**	Draw different earthing systems.
	CO5	**EE-307.5**	Draw different types of Supporting structures.

LEARNING OUTCOMES

Graphical symbols, views of fuses and couplings, Measuring instruments and Guarding systems

1.1 Draw the standard symbols of electrical components andfixtures
1.2 Draw the free hand sketchesof
(i) Sectional views of Rewirablefuse
(ii) Sectional views of Cartridgefuse
(iii) Sectional elevation of HRCfuse

1.3 Draw sectional elevation and end views of a Protected type shaft coupling from the given data.
1.4 Draw sectional elevation and end views of a UnProtected type shaft coupling from the given data.
1.5 Draw the free hand sketches of M.I. , M.C. ,Instruments
1.6 Draw the free hand sketch of Dynamometer typewattmeter.
1.7 Draw the free hand sketch of Induction type single phase energymeter.
1.8 Draw the views of the guarding methods in the followingcases
(i) Telephone lines under power lines (ii) H.V. line over L.V. line crossing
(iii) H.V. Line over L.V. line on same supports and (iv) H.V. Line crossing over railway lines.

DC machines andStarters

2.1 Draw the assembled sectional views of Pole and Field coils.
2.2 Draw the views including sectional views of yoke and poleassembly
2.3 Draw the assembled view of armature of DC machine with mainparts
2.4 Draw the end view of commutator in a DCMachine
2.5 Draw the Half sectional End view and Elevation of a D.C machine from the given data
2.6 Draw the Face plate of Three Point Starter representing positions of component parts and electrical wiring of a DC shuntmotor
2.7 Draw the Face plate of Four Point Starter representing positions of component parts and electrical wiring of a DC Compoundmotor.

D.C.Windings

3.1 Draw the development winding diagram of a Single Layer Lap connected D.C Machinewith ring diagram showing brush positions and windingtable.
3.2 Draw the development winding diagram of a Single Layer Wave connected D.C Machine with ring diagram showing brush positions and windingtable.
3.3 Draw the development winding diagram of a Double Layer Lap connected D.C Machinewith ring diagram showing brush positions and windingtable.
3.4 Draw the development winding diagram of a Double Layer Wave connected D.C Machinewithring diagram showing brush positions and winding table.

Earthingsystems.

4.1 Draw the dimensioned sketchof
(i) Pipe Earthing (ii) PlateEarthing
4.2 Draw the schematic diagram of a transformer yard earthing and label the parts
4.3 Draw the schematic diagram of a (i) 33/11kV (ii) 132/11kV substations earthing systems and label the parts.

SupportingStructures

5.1 Draw the sketches of following Stay arrangements
(i) Bow stay (ii) Fly stay (iii) Strut Pole
5.2 Draw the views of thefollowing
(i) L.V. line supports for 11 KV and 33KV distributionsystems
(ii) 132 kV steel towers (single circuit and double circuit towers)
(iii) 220kv steel towers (single circuit and double circuit towers).

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-307.1	3							3		
EE-307.2	3	2						3	1	
EE-307.3	3	2						3	1	
EE-307.4	3			1				3		
EE-307.5	3		2					3		
Average	**3**	**2**	**2**	**1**				**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATEDCOURSE CONTENTS

G**raphical symbols, views of fuses and couplings, Measuring instruments and Guarding systems**
Graphical symbols as per ISI standards, Views of fuses, Rewirable fuse, Cartridge fuse, HRC fuse, Shaft coupling (Protected and unprotected type) - M.I and MC Instruments- Dynamo Type watt meter- Induction Type Single phase energy meter- Gaurding Systems employed for the Poles while crossing the Roads and Railway Lines.

DC machine andstarters
Stator yoke and pole assembly, pole and field coil assembly main and interpoles, Armature of a small DC machine, Commutator of DC machine – Half sectional end view and elevation of D.c machine - Face plate type 3 point and 4 point starters.

D.CWindings
Single Layer and double layer Lap and Wave Windings - Winding tables- -Brush location – Equalizer rings.

Earthingsystems
Pipe earthing, plate earthing, Transformer yard earthing, Substation earthing system.

Supportingstructures
Stay arrangements for L.V and H.V. Systems - Views of line supports for 11 KV and 33 KV distribution systems –132KV and 220 KV steel Towers.

REFERENCE BOOKS

1. Simpson -Electrical EngineeringDrawing
2. C.R.Dargon.-Electrical Engineering Drawing-Asian
3. K.L.Narang.-Electrical EngineeringDrawing-Satya prakashan,New Delhi publishers
4. Surjit singh-Electrical EngineeringDrawing-I-KATSON BOOKS.
5. Dr. S.K. Bhattacharya - Electrical Engineering Drawing-New AGE International(P) Ltd. Publishers
6. M.Yogesh,B.S.Nagaraja-Computer Aided Electrical Drawing 1st Edition-Kindle Edition

Blue print:

S.No.	Unit title	No. of periods	Weightage allocated	Marks wise distribution of weightage			Question wise distribution of weightage			CO'S mapped
				R	U	Ap	R	U	Ap	
1.	Graphical symbols, views of fuses and couplings, Measuring instruments and Guarding systems	18	10	10	0	0	2	0	0	**CO1**
2.	D.C. Machines and Starters	30	25	5	20	0	1	1	0	**CO2**
3.	D.C. Windings	18	20	0	20	0	0	1	0	**CO3**
4.	Earthing Systems	12								**CO4**
5.	Supporting structures	12	5	5	0	0	1	0	0	**CO5**
Total		**90**	**60**	**20**	**40**	**0**	**4**	**2**	**0**	

Syllabus to be covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 2.7
Unit Test-II	From 3.1 to 5.2

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-307
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-307 : ELECTRICAL ENGINEERING DRAWING - I

Time:120 Minutes Total Marks: 40 Marks

PART-A **4 x 5 = 20**

Instructions:

i. **Answer all questions.**
ii. **Each question carries five marks.**

1. Draw the cross-sectional view of HRC fuse and label the parts. **CO1**
2. Draw wiring diagram of three point starter used for D.C shunt motor and label the parts. **CO2**
3. Draw the following Symbols
   (a) Lamp (b)Moving Coil Instrument (c).Buzzer (d). Lightning Arrestor **CO1**
4. Draw the face plate of 3-point starter and lable the parts. **CO2**

PART-B **1 X 20 = 20**

Instructions:

i. **Answer the following question.**
ii. **This question carries TWENTY marks**.

5. (a) Draw the half sectional end view and elevation of a 50 kW D.C. Generator with the main dimensions as given below: **CO2**

External diameter of armature stamping	:	380 mm
Internal diameter of armature stamping	:	200 mm
No. of slots	:	32
Size of slot	:	35×15 mm
Total height of main pole including pole shoe	:	140 mm
No. of main poles	:	4
Main pole size	:	70 x 30 mm
Length of main pole	:	190 mm
No. of inter poles	:	4
Inter pole size	:	100×40 mm
Air gap	:	4 mm
Length of the armature core	:	240 mm
Thickness of yoke	:	50 mm
Diameter of commuter up to contact surface	:	220 mm
Diameter of commuter up to riser	:	240 mm
Shaft diameter at coupling end	:	60 mm
Total length of the shaft	:	600 mm

All dimensions are in mm. Assume any missing data. (20 marks)

(OR)

(b) Draw the half sectional elevation and end view of the armature core: (20 marks)

CO2

Hub and shaft whose dimensions are as follows :

Diameter of the shaft	:	130 mm
Diameter of the core	:	900 mm
Diameter of the hub	:	770 mm
Radius from the centre of the Axle to the bolt circle	:	210 mm
Diameter of bolt head	:	20 mm
Dimension of ventilating duct	:	200 mm towards bolt and 240 mm towards axle
Distance of duct from the axle centre	:	105 mm
Flange thickness	:	20 mm
Depth of flange	:	90 mm
Length of core gap equally spaced	:	230 mm with 10 mm gap
Total distance between the two hubs	:	500 mm

Assume the missing dimensions.

***

MODEL PAPER – FORMATIVE ASSESMENT-2
C-20-EE-307
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-307 : ELECTRICAL ENGINEERING DRAWING - I

Time: 90 Minutes Total Marks: 40 Marks

PART-A **4 x 5 = 20**

Instructions:

i. Answer all questions.

ii. Each question carries five marks.

1. Draw the Bow stay arrangement of Stay Tightner and lable the parts . (**CO5)**

2. Draw the double circuit 132KV steel tower . (**CO5)**

3. Draw the schematic diagram of Transformer yard Earthing and label the parts. (**CO3)**

4. Draw the face plate of 3-point starter. (**CO2)**

PART-B **1 X 20 = 20**

Instructions:

i. Answer the following question.

ii. This question carries TWENTY marks.

5. (a) Draw the developed diagram of Single layer LAP connected DC machine having 32 Conductors with 4-pole and mark the brush position and winding diagram. (**CO3)**

(OR)

(b) Draw the dimensioned sketch of Pipe earthing system. (**CO4)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-307
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-307 : ELECTRICAL ENGINEERING DRAWING - I

Time: 3 hours Total Marks: 60

PART-A **4 x 5 = 20**

Instructions:

i. **Answer all questions.**
ii. **Each question carries five marks.**

1. Draw the cross-sectional view of HRC fuse and label the parts. **CO1**
2. Draw the half-sectional end view and elevation of protected flange coupling. **CO1**
3. Draw wiring diagram of three point starter for D.C shunt motor and label the parts. **CO2**
4. Draw a neat sketch of bow stay arrangement for a L.T. pole and label the parts. **CO5**

PART-B **2 x 20 = 40**

Instructions:

i. **Answer all questions.**
ii. **Each question carries twenty marks**.

5. (a) Draw the half sectional end view and elevation of a 50 kW D.C. Generator with the main dimensions as given below: **CO2**

External diameter of armature stamping	:	380 mm
Internal diameter of armature stamping	:	200 mm
No. of slots	:	32
Size of slot	:	35×15 mm
Total height of main pole including pole shoe	:	140 mm
No. of main poles	:	4
Main pole size	:	70 x 30 mm
Length of main pole	:	190 mm
No. of inter poles	:	4
Inter pole size	:	100×40 mm
Air gap	:	4 mm
Length of the armature core	:	240 mm
Thickness of yoke	:	50 mm
Diameter of commuter up to contact surface	:	220 mm
Diameter of commuter up to riser	:	240 mm
Shaft diameter at coupling end	:	60 mm
Total length of the shaft	:	600 mm

Assume any missing data. (20 marks)

(OR)

(b) Draw the half sectional elevation and end view of the armature core: (20 marks) **CO2**

Hub and shaft whose dimensions are as follows :

Diameter of the shaft	:	130 mm
Diameter of the core	:	900 mm
Diameter of the hub	:	770 mm
Radius from the centre of the Axle to the bolt circle	:	210 mm
Diameter of bolt head	:	20 mm

Dimension of ventilating duct	:	200 mm towards bolt and 240 mm towards axle
Distance of duct from the axle centre	:	105 mm
Flange thickness	:	20 mm
Depth of flange	:	90 mm
Length of core gap equally spaced	:	230 mm with 10 mm gap
Total distance between the two hubs	:	500 mm

Assume the missing dimensions.

6. (a1) Develop a single layer wave winding for a 34-armature conductor, 4-pole d.c. machine with ring diagram showing the brush position and winding table.(10 marks) **CO3**

(a2) Draw the schematic diagram of a 132 / 11kv substation earthing system and label the parts. (10 marks) **CO4**

(OR)

(b1) Develop a simple lap winding for a 36-armature conductors,6-pole d.c. machine with ring diagram showing the brush position and winding table. (10 marks)**CO3**

(b2) Draw dimensional plate earthing and label the parts. (10 marks) **CO4**

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Electrical Machines – I Laboratory

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
EE-308	Electrical Machines – I Laboratory	3	45	40	60

S. no.	Unit Title	No. of Periods	CO'S Mapped
1	Characteristics of DC Generators	24	CO1,CO2, CO3
2	Testing and Speed control of DC motors	21	CO4,CO5
Total Periods		45	

CourseObjectives:

Course Objectives	i. To familiarise with the knowledge of different materials , tools used in Electrical Engineeringprocess ii. To know the etiquette of working with the fellowworkforce. iii. To reinforce theoretical concepts by conducting Relevantexperiments.

CourseOutcomes:

Course outcomes	**CO1**	EE-308.1	Demonstrate the skill of planning and organising experimental setup for D.C Generators.
	CO2	EE-308.2	Perform precise operations on D.C Generators for investigating their performance
	CO3	EE-308.3	Recognise various parameters, their variations and sketch them graphically of D.C Generators
	CO4	EE-308.4	Analyse the experimental results to draw inferences, to make recommendations for selection of D. C motor.
	CO5	EE-308.5	Run the motor at various speeds for different applications and plotting various characteristics.

Learning outcomes:

Characteristics of DCGenerators

1. Obtain OCC of a DC shunt Generator at below, rated and above ratedspeeds.
2. Obtain Internal and External characteristics of DC ShuntGenerator.
3. Obtain Internal and External characteristics of DC SeriesGenerator.
4. Obtain Internal and External characteristics of DC CompoundGenerator

Testing and Speed Control of D.CMotors

5. Identify the terminals of the following DCMachines

i) DC Shuntmotor ii) DC SeriesMotor iii) CompoundMotor.

6. identify various parts of dc machine using cutsectional working model

i) DC Shuntmotor ii) DC SeriesMotor iii) CompoundMotor.

7. Obtain performance characteristics by conducting Brake Test on DC ShuntMotor
8. Obtain performance characteristics by conducting Brake Test on DC SeriesMotor.

9. Obtain performance characteristics by conducting Brake Test on DC CompoundMotor.

10. Speed control of DC Shunt Motorby
i)Rheostatic controlmethod ii)Field controlmethod
11. ObtaintheperformanceofaDCShuntMotorbyconductingSwinburne'stest.

Competencies to be achieved by the student

S. No.	Experiment title	Competencies
1	OCC of a DC shunt Generator at below, rated and above rated speeds.	• Draw the relevant circuit diagram for OCCtest. • Select the proper DC supplyvoltage. • Choose the proper range of voltmeter, ammeterand rheostat. • Make the connections according to circuitdiagram. • Ensure that all the instruments are connected in proper polarity. • Check the speed and maintain it constant by meansof field regulator before taking every reading. • Observe and note the readings in a tabularform. • Drawthe graphbetweenI_fVs $E_{g.}$
2, 3 ,4	Internal and External characteristics of DC shunt generator DC series generator DC compound generator	• Draw the relevant circuit diagram • Select the proper DC supplyvoltage. • Choose the proper range of voltmeter, ammeterand rheostat. • Make the connections according to circuitdiagram. • Ensure that all the instruments are connected in proper polarity. • Check the speed and maintain it constant by meansof field regulator before taking every reading. • Apply load in steps upto rated current • Observe and note the readings in a tabularform. • Drawthe graphbetweenI_aVs E_g , I_lVs V_l
5	Identify the terminals of the following DC Machines (a)DC Shuntmotor (b)DC SeriesMotor (c) DC Compound Motor.	• Note down the name platedetails. • Locate the different terminals of a DC Shunt Motor / DC Series Motor, DC CompoundMotor. • Measure the resistance across different terminals using multimeter. • Record the resistance values of theterminals. • Identify the armature and shunt field / series field resistance according to resistance valuesobserved.

6	Identify various parts of the following DC Machines (d)DC Shuntmotor (e)DC SeriesMotor DC Compound Motor	• Identify feild system • Identify conductor system • Identify type of insulation in a given machine • Identify type of bearings used
7,8,9	Performance characteristics of DC (Shunt, Series, Compound) Motors by conducting Brake Test	• Select the proper DC supplyvoltage • Choose the proper range of voltmeter, ammeter and rheostat. • Connect the circuit as per the circuitdiagram. • Ensure that all the instruments are connected in proper polarity. • Start the Motor with thestarter. • Note the readings of speed N, current I and spring balance for a particularload. • Pour water in the break drumcarefully. • Check the speed and maintain it constant by means of field regulator before taking everyreading. • Note readings by varying loads on the motor upto rated current. • Calculate the torque, input, output andefficiency. • Draw performance curves ofmotor
10	Speed control of DC Shunt Motor by (a) Rheostatic control method (b) Field control method	• Select the proper DC supplyvoltage • Choose the proper range of voltmeter, ammeterand • rheostat. • Connect the circuit as per the circuitdiagram. • Ensure that all the instruments are connected inproper • polarity. • Handle the 3- pointStarter • Set the Field Resistance of the motor bygradually • moving the knob on the rheostat coil. • Record the readings of Ammeter and Tachometerby • gradually increasing the resistance in the Field rheostat. • Draw the graph speed Vs Fieldcurrent. • Observe the graph and write theconclusions.
11		• Select the proper DC supplyvoltage • Choose the proper range of voltmeter, ammeter and rheostat. • Connect the circuit as per the circuitdiagram. • Ensure that all the instruments are connected in proper polarity. • keep the rheostat is maximum position in armature so

	Performance of a DC Shunt Motor by conducting Swinburne's test.	that minimum voltage is applied toarmature • Adjusting the field rheostat to minimumposition • Adjust the speed of the motor to its rated value by usingits FieldRheostat. • Taking the readings of Ammeter and Voltage byopening the Fieldswitch • Taking the readings of Voltage and current by closing the field switch and gradually decreasing the resistance in the Rheostat. • Calculate the efficiency of the DC Machine as a Generator and as a Motor at variousloads. • Draw theconclusions Adjusting the field rheostat to minimumposition • Adjust the speed of the motor to its rated value by usingits FieldRheostat. • Taking the readings of Ammeter and Voltage byopening the Fieldswitch • Taking the readings of Voltage and current by closing the field switch and gradually decreasing the resistance in the Rheostat. • Calculate the efficiency of the DC Machine as a Generator and as a Motor at variousloads. • Draw theconclusions

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-308.1	3							3		
EE-308.2	3							3	2	
EE-308.3	3	1.5						3		
EE-308.4	3	1	1					3		
EE-308.5	3				1			3		
Average	3	1.25	1		1			3	2	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

PROGRAMMING IN C LABORATORY

Course Code	Course Title	No. of periods / Week	Total No.of Periods	Marks for FA	Marks for SA
EE-309 A	PROGRAMMING IN C LABORATORY	3	45	40	60

COURSE OUTCOMES MAPPING

S.No	Unit Titles	No. of periods	CO's Mapped
1.	C Programming Basics	6	CO1,
2.	Decision & Loop Control Statements	9	CO2
3.	Exercises on functions	6	CO3
4	Arrays, Strings and Pointers in C	9	CO4
5.	Structures, Unions &Pre-processor Directives	6	C05
	Total	45	

COURSE OBJECTIVES	i) To impart adequate knowledge on the need of programming languages andproblem solving techniques.
	ii) To develop programming skills using the fundamentals and basics of C language.
	iii) To enable effective usage of arrays, structures, functions, pointers and toimplement the memory management concepts.

COURSE OUTCOMES	CO1	EE-309A.1	Design problem solving with flow chart and algorithm.
	CO2	EE-309A.2	Practice conditional and iterative statements to write C programs.
	CO3	EE-309A.3	Execute C programs that use functions.
	CO4	EE-309A.4	Demonstrate usage of functions to solve real time problems using arrays.
	CO5	EE-309A.5	Practice on structures, strings and pointers.

LEARNING OUTCOMES

C Programming Basics

Editing, compiling and executing simple programs (using printf and scanffunctions).
Exercises on operators inC.

Decision & Loop Control Statements

Exercises on conditional statements (if, if – else, else ifstatements).
Exercises on switch statements and conditionaloperator.
Exercises on looping statements (while, do – while and forstatements).

Exercises on functions

Exercises on functions to demonstrate prototyping, parameter passing, function returning values.

Exercises onrecursion.

Arrays, Strings and Pointers in C

Exercises on one dimensional arrays and two dimensionalarrays.

Exercises on Strings handling functions comparison, copying andconcatenation.

Exercises to demonstrate use of Pointers, pointers as function arguments, functions returning pointers.

Structures, Unions &Pre-processor Directives

Exercise onstructures.

Exercises on unions and C pre-processorDirectives.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-309A.1	3	1						3		
EE-309A.2	3							3		
EE-309A.3	3	1	1	1				3		
EE-309A.4	3							3		
EE-309A.5	3	1	1	1				3		
Average	**3**	**1**	**1**	**1**				**3**		

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

Note : 1. This Lab is to be handled by Computer Engg. faculty

2. Paper setting and paper evaluation is also to be done by Computer Engg Faculty.

HYPONATED COURSE CONTENTS

C Programming Basics

Editing, compiling and executing simple programs (using printf and scanf functions) - Exercises on operators in C.

Decision & Loop Control Statements

Exercises on conditional statements (if, if – else, else if statements) , switch statements and conditional operator) - Exercises on looping statements (while, do – while and for statements).

Exercises on functions
Exercises on functions to demonstrate prototyping, parameter passing, function - returning values and recursion.

Arrays, Strings and Pointers in C
Exercises on one dimensional arrays and two dimensional arrays, Strings handling functions comparison, copying and concatenation - Exercises to demonstrate use of Pointers, pointers as function arguments, functions returning pointers

Structures, Unions & Preprocessor Directives
Exercise on structures, unions and C pre-processor Directives.

ELECTRICAL CAD LAB

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-309 B	ELECTRICAL CAD LAB	3	45	40	60

COURSE OUTCOMES MAPPING

S.No	Unit Title	No. of periods	CO's Mapped
1.	Exercise on various tool bars, menus and standard commands	2	CO1
2.	Practice on 2D drawing commands and modify tools	6	CO1
3.	Practice on dimensioning commands and formatting commands	3	CO1
4	Practice on Insert commands and view commands	3	CO1
5.	Exercise on drawing isometric drawings in 2D and introduction to 3D	5	CO1
6	Exercise on drawing Electrical symbols	3	CO2
7	Drawing related to electrical wiring (house wiring , multi storied buiding , commercial complex,godown wiring)	9	CO2
8	Exercise on drawing electrical poles and towers	3	CO3
9	Exercise on drawing earthing systems with dimensions	3	CO3
10	Exercise on drawing of the core section of transformer	3	CO4
11	Exercise on pole mounted and plinth mounted substations	2	CO4
12	Drawing the end view of induction motor	3	CO5
	Total	**45**	

COURSE OBJECTIVES	1) To create control designs using standard-based commands and drafting tools.
	2) To facilitate error-checking and schematic designing.
	3) Prepare 3D drawings.
	4) To help control designers to design and implement the control systems efficiently.

COURSE OUTCOMES	CO1	EE-309B.1	Prepare different engineering drawing models using basic commands.
	CO2	EE-309B.2	Draw electrical circuits using basic symbols.
	CO3	EE-309B.3	Prepare the drawing of various poles, towers and earthing systems.
	CO4	EE-309B.4	Daw core sections of Transformers and Pole mounted substations.
	CO5	EE-309B.5	Development of sectional views of D.C machine.

LEARNING OUTCOMES

Exercise on various tool bars, menus and standard commands.

1. Study components in menu bar, Customise and arrange tool bar, Display the drawing created in the workingarea
2. Study of user coordinate system (UCS), Increase or decreaselayouts
3. Give the inputs in the command bar, Display name and purpose of the tools, Study cross hairto locate thecursor
4. Invoke the commands, Getting started with AutoCAD, Create a new file, Open a file, Save a file, Close afile
5. Delete the object or text , Copy the object or text, Paste entities, Zoom anobject.

Practice Exercises on 2D drawing commands and modify tools.

6. Use LINE command, MLINE command, POLYLINEcommand
7 Draw a circle using CIRCLE command, with centre point and radius, POLYGON command, HELIX command.
8. Draw a rectangular, Triangular and quadrilateral areas filled with a solid, colour with the help of planetool.
9. Understand SPLINE command, ELLIPSE command, DIVcommand.
10. Understand INSERT command, HATCH command, MIRROR command, ARRAYcommand.
11. Understand STRETCH command, TRIM command, BREAK command, JOINTcommand,
12. Understand FILLET command, CHAMFER command, EXPLODE command, GROUP command.

Practice on dimensioning commands and formatting commands

13. QDIM command, Practice LINEAR ,ALIGNED and COORDINATEdimensions RADIUS or DIAMETER commands, ANGULUR dimension command, ARC LENGTH commandBASELINE command, CENTREMARKcommand, LAYER command, Control the visibility of objects and assigned properties to objects, Practice the locking unlocking oflayers

14. Write a text to drawing, change font size and style, Create a standard naming convention to a text styles, table styles, layer styles, dimension stylesetc.

Practice on Insert commands and view commands

15. Insert blocks into current drawing file using INSERTcommand
16. Understand ATTACH RASTER IMAGE command, REDRAWcommand
17. Draw the orthographic views (side view, top view, front view) of anyobject
18. Draw the isometric views of any object, SHADE command, HIDEcommand.

Practice on isometric drawings in 2D

19. Visualise the isometric view SW,NE isometric views, Isometric SNAP andGRID
20. Use set snap spacing, Change the default axis colours, size of the crosshair display by using crosshairtab
21. Create an isometric circle on the current isometric plane using EllipseIsocircle

Electrical symbols

22. Draw various electrical symbols

Electrical wiring

23. Drawing of electrical wiring of a house .
24. Drawing of electrical wiring circuit of multi storied building
25. Drawing of electrical wiring circuit of godownwiring
26. Drawing of electrical wiring circuit of commercial complex

Electrical poles and towers

27. Drawing of different electrical poles with cross-arms, insulators and staysets
28. Drawing of transmissiontowers

Earthing systems with dimensions

29. Drawing of pipe earthing showing thedimensions
30. Drawing of plate earthing showing thedimensions

Core sections of transformer

31. Drawing of plan and elevation of different stepped cores of single phase transformer.

Pole mounted substations

32. Drawing of Pole mounted substation with dimensions

End view of a D,C Machine

33. Drawing of end view of D,C Machine

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-309B.1	3		1	1				3	1	
EE-309B.2	3							3	1	
EE-309B.3	3							3	1	
EE-309B.4	3							3	1	
EE-309B.5	3	2	1					3	1	
Average	**3**	**2**	**1**	**1**				**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Exercise on various tool bars-menus and standard commands.
Study components in menu bar-Customise and arrange tool bar-Display the drawing created in the working area-user coordinate system (UCS)-Increase or decrease layouts-Give the inputs in the command bar-Display name and purpose of the tools-Study cross hair to locate the cursor-Invoke the commands-Getting started with AutoCAD-Create a new file-Open a file-Save a file-Close a file- Delete the object or text -Copy the object or text-Paste entities-Zoom anobject.

Practice Exercises on 2D drawing commands and modify tools.
Use LINE command-MLINE command-POLYLINE command-Draw a circle using CIRCLE command-with centre point and radius-POLYGON command-HELIX command-Draw a rectangular-Triangular and quadrilateral areas filled with a solid-colour with the help of plane tool-Understand SPLINE command-ELLIPSE command- DIV command-Understand INSERT command-HATCH command- MIRROR command-ARRAY command-Understand STRETCH command-TRIM command-BREAK command-JOINT command-Understand FILLET command-CHAMFER command-EXPLODE command- GROUP command

Practice on dimensioning commands and formatting commands
QDIM command-Practice LINEAR-ALIGNED and COORDINATE dimensions-RADIUS or DIAMETER commands-ANGULUR dimension command-ARC LENGTH command-BASELINE command-CENTREMARK command-LAYER command-Control the visibility of objects and assigned properties to objects-Practice the locking unlocking of layers-Write a text to drawing-change font size and style- Create a standard naming convention to a text styles-table styles-layer styles-dimension styles etc.

Practice on Insert commands and view commands
Insert blocks into current drawing file using INSERT command-Understand ATTACH RASTER IMAGE command-REDRAW command-Draw the orthographic views (side view-top view-front view) of any object-Draw the isometric views of any object-SHADE command-HIDE command.

Practice on isometric drawings in 2D
Visualise the isometric view SW-NE isometric views-Isometric SNAP and GRID-Use set snap spacing- Change the default axis colours-size of the crosshair display by using crosshair tab-Create an isometric circle on the current isometric plane using Ellipse Isocircle.

Electrical symbols
Draw various electrical symbols

Electrical wiring
Drawing of electrical wiring circuit of house wiring , multi storied buiding , commercial complex,godown wiring

Electrical poles and towers
Drawing of different electrical poles with cross-arms-insulators and stay sets-transmission towers

Earthing systems with dimensions
Drawing of pipe earthing showing the dimensions-plate earthing showing the dimensions

Core sections of transformer
Drawing of plan and elevation of different stepped cores of single phase transformer.

Pole mounted substations
Drawing of Pole mounted substation with dimensions

End view of a D.C Machine
Drawing of end view of D.C Machine.

ELECTRICAL CIRCUITS AND MEASURING INSTRUMENTS LAB

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-310	ELECTRICAL CIRCUITS AND MEASURING INSTRUMENTS LAB	3	45	40	60

COURSE OUTCOMES MAPPING

S.No	Unit Titles	No. of periods	CO's Mapped
1.	Verification of Circuit Laws	6	CO1
2.	Verification of Circuit Theorems	9	CO2
3.	Calibration of Measuring Instruments	9	CO3
4	Determination of Circuit Parameters	9	CO4
5	Measurement of Power	12	CO5
	Total	**45**	

COURSE OBJECTIVES	i) To practice on different network theorems to find electrical parameters.
	ii) To know the procedures for measuring resistance of different ranges.
	iii) To perform experiments to measure power, power factor and energy.

COURSE OUTCOMES	CO1	EE-310.1	Conduct test for verification of different circuit laws.
	CO2	EE-310.2	Perform a test for Analysing different networks using various theorems.
	CO3	EE-310.3	Conduct a test for measurement of power and energy.
	CO4	EE-310.4	Calculation of various circuit parameters of inductive circuits using suitable method.
	CO5	EE-310.5	Measurement of power in AC single phase and three phase circuit by using different methods.

LEARNING OUTCOMES

Verification of Circuit Laws

1. VerificationofOhm'sLawandlimitationsofOhm'slaw
2. VerificationofKirchhoff'sVoltagelawandcurrentLaw

Verification of Circuit Theorems

3. Verification of Super positiontheorem
4. Verification of Thevenin'stheorem
5. Verification of Maximum Power Transfertheorem

Calibration of Measuring Instruments

6. Calibration of dynamometer type ofwattmeter
7. Calibration of single phase induction type energymeter

Determination of Circuit Parameters

8. Determination of Q-factor and Power factor of an Inductivecoil
9. Determination of Idle & Energy components of current in a single phase inductivecircuit

Measurement of Power

10. Measurement of power in single phase circuit by 3-Voltmetermethod
11. Measurement of power in single phase circuit by 3-Ammetermethod
12. Measurement of power in three phase balanced circuit by 2-Wattmetermethod

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-310.1	3							3		
EE-310.2	3	1.5						3		
EE-310.3	3							3		
EE-310.4	3		1		1			3	1	
EE-310.5	3		1		1			3	1	
Average	**3**	**1.5**	**1**		**1**			**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Verification of Circuit Laws

VerificationofOhm'sLawandlimitationsofOhm'slaw-VerificationofKirchhoff'sVoltagelawand current Law

Verification of Circuit Theorems

Verification of Super position theorem - Verification of Thevenin's theorem - Verification of Maximum Power Transfer theorem

Calibration of Measuring Instruments

Calibration of dynamometer type of wattmeter - Calibration of single phase induction type energy meter

Determination of Circuit Parameters

Determination of Q-factor and Power factor of an Inductive coil - Determination of Idle & Energy components of current in a single phase inductive circuit

Measurement ofPower

Measurement of power in single phase circuit by 3-Voltmeter method - Measurement of power in single phase circuit by 3-Ammeter method - Measurement of power in three phase balanced circuit by 2-Wattmetermethod

IV - SEMESTER

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical/Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
EE - 401	Engineering Mathematics- III	3	-	45	3	20	80	100
EE - 402	Electrical Machines- II (Transformer s& Alternators)	5	-	75	3	20	80	100
EE - 403	Power Systems – II (Transmission &Distribution)	4	-	60	3	20	80	100
EE - 404	Electrical Installation and Estimation	4	-	60	3	20	80	100
EE-405	Electronics Engineering	4	-	60	3	20	80	100
EE -406	GENERAL MECHANICAL ENGINEERING	4	_	60	3	20	80	100
PRACTICAL								
EE -407	Electrical EngineeringDrawing -II	-	6	90	3	40	60	100
EE - 408	Communication Skills Laboratory	-	3	45	3	40	60	100
EE - 409	(A) Electrical Machines – II Laboratory (B) Field Practice in Electrical Engineering	- -	3 3	45 45	$1_{1/2}$ $1_{1/2}$	20 20	30 30	50 50
EE - 410	Electronics Engineering Laboratory		3	45	3	40	60	100
TOTAL		**24**	**18**	**630**		**280**	**720**	**1000**

C-20

ENGINEERING MATHEMATICS-III

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
EE-401	Engineering Mathematics-III	3	45	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Higher order Linear Differential equations with constant coefficients	15	CO1
2	Laplace Transforms	18	CO2
3	Fourier Series	12	CO3
	Total Periods	**45**	

Course Objectives	(i) To learn the principles of solving differential equations of second and higher order. (ii) To comprehend the concept of Laplace transformations and inverse Laplace transformations. (iii) To understand the concept of Fourier Series expansion of functions.

Course Outcomes	CO1	Solve homogeneous and non-homogeneous differential equations of second and higher order.
	CO2	Determine Laplace and inverse Laplace transforms of various functions.
	CO3	Expand given functions as Fourier series and half- range Fourier Sine and Cosine series.

ENGINEERING MATHEMATICS – III

Learning Outcomes

Unit-I

Differential Equations of higher order

C.O. 1 Solve homogeneous and non-homogeneous differential equation of second and higher order.

L.O 1.1 Solve Differential equations of the type $(aD^2 + bD + c)\ y = 0$ where a, b, c are real numbers and provide examples.

1.2 Solve higher order homogeneous differential equations with constant coefficients and provide examples.

1.3 Define complementary function, particular Integral and general solution of a non-homogeneous differential equation.

1.4 Describe the methods of solving $f(D)\ y = X$ where $f(D)$ is a polynomial of n^{th} order and X is a function of the forms and their linear combinations where n is a positive integer, with examples.

Unit-II

Laplace Transforms

C.O. 2 Find Laplace and inverse Laplace transforms of various functions.

L.O. 2.1 Define Laplace Transform and explain the sufficient conditions of existence of Laplace Transform

2.2. Obtain Laplace transforms of standard functions and solve simple problems.

2.3 Write the properties of Laplace Transform – Linearity property, First shifting theorem (without proof) and Change of Scale property and solve simple problems.

2.4. Write the Laplace Transform of unit step function and second shifting theorem (without proof) and solve simple problems.

2.5. Write formulae for Laplace transform of functions with multiplication by and division by t,Laplace transform of derivatives, evaluation of some definite integrals using Laplace Transforms
and solve simple problems.

2.6 Define inverse Laplace Transform, obtain inverse Laplace Transforms of standard functions and solve simple problems.

2.7 Write linearity property, first and second shifting theorems (without proof), change of scaleproperty of inverse Laplace transform and solve simple problems.

2.8 Write inverse Laplace transforms of derivatives and integrals and solve simple problems.

2.9 Write inverse Laplace transforms of functions with multiplication by s and division by and solve simple problems.

2.10 Write inverse Laplace transforms of functions using partial fractions and solve some simple problems.

2.10 Define convolution of two functions, state convolution theorem (without proof) and solve simple problems.

Unit-III

Fourier series

C.O. 3 Expand given functions as Fourier series and half- range Fourier Sine and Cosine series

L.O. 3.1 Define the orthogonality of functions in an interval.

3.2 Define Fourier series of a function in the intervals and and write the Euler's formulae for determining the Fourier coefficients.

3.3 Write sufficient conditions for the existence of Fourier series expansion of a function.

3.4 Find Fourier series of simple functions in the range $(0, 2\pi)$ and $(-\pi, \pi)$

3.5 Write Fourier series for even and odd functions in the interval and expand simple functions.

3.6 Write Fourier series expansion of a function over the interval $(0, 2l)$ and and expand simple functions.

3.7 Write half-range Fourier sine and cosine series of a function over the interval $(0, \pi)$ and and expand simple functions.

Engineering Mathematics – III
CO/PO - Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	1				2	3	2
CO2	3	3	3	3				3	3	3
CO3	3	3	3	3				3	3	3
Avg	3	2.66	2.33	2.33				2.66	3	2.66

3 = Strongly mapped (High), **2 =** Moderately mapped (Medium), **1 =** Slightly mapped (Low)

Note:

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

PSO1: An ability to understand the concepts of basic mathematical concepts and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.

PSO2: An ability to solve the Engineering problems using latest software tool, along with analytical skills to arrive at faster and appropriate solutions.

PSO3: Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

C-20
Engineering Mathematics – III
PO- CO – Mapping strength

PO no	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		No	%		
1	CO1, CO2, CO3	45	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3	37	82.2%	3	
3	CO1, CO2, CO3	32	71.1%	3	
4	CO1, CO2, CO3	32	71.1%	3	
5					
6					
7					
PSO 1	CO1, CO2, CO3	37	82.2%	3	
PSO 2	CO1, CO2, CO3	45	100%	3	
PSO 3	CO1, CO2, CO3	36	80%	3	

ENGINEERING MATHEMATICS – III
(Common Subject)
Course Content

Unit I: Differential Equations of higher order

1. Solve Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.
2. Solve Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X where X is in the form k(constant), e^{ax}, sinax, cosax, x^n, where n is a positive integer, finding complimentary function, particular integral and general solution.

Unit II: Laplace Transforms

3. Definition, sufficient conditions for existence of LT, LT of elementary functions, linearity property, state first shifting theorem, change of scale property, multiplication by t^n, division by t, LT of derivatives and integrals, LT of unit step function, state second shifting theorem, inverse Laplace transforms- state shifting theorems and change of scale property, multiplication by s^n and division by s, derivatives, integrals, examples of inverse LT using partial fractions, state convolution theorem with simple examples.

Unit III: Fourier series

4. Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval and , Euler's formulae , sufficient conditions for existence of Fourier series expansion of a function, Fourier series expansion of basic functions limited to k(constant), and their combinations over the intervals , Fourier series for even and odd functions over , Fourier half-range sine and cosine series over and

Textbook:

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers
2. M.R. Spiegel, Schaum's Outline of Laplace Transforms, Schaums' Series
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

Blue print

S. No	Chapter/ Unit title	No of Periods	Weightage allotted	Marks wise distribution of weightage				Question wise distribution of weightage				COs mapped
				R	U	Ap	An	R	U	Ap	An	
1	Unit – I Higher order Linear Differential equations with constant coefficients	15	28	11	11	6	*	2	2	2	*	CO1
2	Unit - II Laplace Transforms	18	33	11	11	11	*	2	2	2	*	CO2
3	Unit - III Fourier Series	12	09	3	3	3	*	1	1	1	*	CO3
Total		**45**	**70 + 10***	**25**	**25**	**20**	**10 ***	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

R: Remembering Type : 25 Marks
U: understanding Type : 25 Marks
Ap: Application Type : 20 Marks
An: Analysing Type : 10 Marks

C-20
Engineering Mathematics – III
Unit Test Syllabus

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From LO 1.1 to 2.5
Unit Test-II	From LO 2.6 to 3.7

Unit Test I **C –20, EE-401**

State Board of Technical Education and Training, A. P

IV Semester

Subject name: Engineering Mathematics-III

Sub Code: EE-401

Time : 90 minutes Max.marks:40

Part-A **16Marks**

Instructions: **(1) Answer all questions.**

(2) First question carries four marks and the remaining questions carry three marks each

1. Answer the following:

   a. Write the auxiliary equation for given differential equation $\int \sin^m x.\cos^n x\,dx,$ **(CO1)**

   b. For given differential equation $i)\frac{1}{a^2+x^2},\frac{1}{a^2-x^2},\frac{1}{x^2-a^2}$ $ii)\frac{1}{\sqrt{a^2+x^2}},\frac{1}{\sqrt{a^2-x^2}},\frac{1}{\sqrt{x^2-a^2}}$ $iii)\sqrt{x^2-a^2},\sqrt{x^2+a^2},\sqrt{a^2-x^2}$, if roots of auxiliary equation are 1,-1,then $\int x^8 dx$ _____ **(CO1)**

   c. $\int \frac{1}{\sqrt{4-x^2}}dx.$ _____ **(CO2)**

   d. $\int e^x\left(f(x)+f'(x)\right)dx = e^x f(x)+c$ then $\int_0^{\frac{\pi}{2}} \cos x dx$: State TRUE/FALSE **(CO2)**

2. Solve $\int\left(3\cos ec^2 x-2\tan x\sec x+\frac{1}{x}\right)dx.$ **(CO1)**

3. Find the particular integral of $\int \frac{\sin(\log x)}{x}dx.$ **(CO1)**

4. Evaluate $\int e^x \sin 2x dx.$ **(CO2)**

5. Evaluate $\int_0^{\frac{\pi}{2}} \sin^2 x dx$ **(CO2)**

Part-B **3×8=24**

Instructions: (1) Answer **all** questions.
(2) Each question carries **eight** marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Solve $\int \frac{1}{5+4\cos x}\,dx.$ **(CO1)**

(or)

B) Solve $\int \sin^4 x \cos^3 x dx.$ **(CO1)**

7. A) Solve $\int \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx.$ **(CO1)**

(or)

B) Solve $\int x^4 e^{2x} dx.$ **(CO1)**

8. A) Evaluate $\int_0^{\frac{\pi}{2}} \cos 4x \cos x dx$ **(CO2)**

(or)

B) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin^{10} x}{\sin^{10} x + \cos^{10} x}\,dx$ **(CO2)**

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C –20, EE-401

Unit Test II

State Board of Technical Education and Training, A. P

IV Semester

Subject name: Engineering Mathematics-III

Sub Code: EE-401

Time : 90 minutes Max.marks:40

Part-A **16Marks**

Instructions: (1) Answer **all** questions.

(2) First question carries **four** marks and the remaining questions carry **three** marks each

1. Answer the following:

   a. $y = f(x)$ then $[a,b]$: State TRUE/FALSE **(CO2)**

   b. $f(x)$ **(CO2)**

   c. $[a,b]$ **(CO2)**

   d. Write the Fourier series for the function $\frac{d^2y}{dx^2} + p^2y = 0$ in the interval

   $\frac{dy}{dx} + Py = Q$ **(CO3)**

2. Evaluate $x^2 + 2x + 1$ **(CO2)**
3. Evaluate $[1,2]$ **(CO2)**
4. Evaluate $x^2 = 4y$ **(CO2)**
5. Evaluate Fourier coefficient $x = 2$ for $x = 4$ in the interval $y = A\cos 2x + B\sin 2x$. **(CO3)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Evaluate $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$. **(CO2)**

   or

   B) Evaluate $y = x^2 - 5x$ **(CO2)**

7. A) Evaluate $y = 4 - 2x$ **(CO2)**

or

B) Evaluate $\sqrt{\log x}$ **(CO2)**

8. A) Obtain the Fourier series for the function $x = e$ in the interval $x = e^2$ **(CO3)**

or

B) Obtain the half range Fourier cosine series of $\frac{x^2}{16} + \frac{y^2}{25} = 1$ in $\int_0^6 \frac{1}{1+x}\,dx$ **(CO3)**

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END EXAM MODEL PAPER

STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS –EE- 401

TIME : 3 HOURS **MODEL PAPER- I** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. Solve $n = 6$ **CO1**
2. Solve $\left(y^2 - 2xy\right)dx + \left(2xy + x^2\right)dy = 0.$ **CO1**
3. Find the particular integral of differential equation $x\frac{dy}{dx} + \frac{y}{x} = x^3y^6.$ **CO1**
4. Find the particular integral of differential equation $\int\left(2\sin x - 3e^x + \frac{4}{1+x^2}\right)dx.$ **CO1**
5. Find $\int e^x \sin e^x dx.$ **CO2**
6. Find $\int \sin 3x \cos 2x dx.$ **CO2**
7. Find $\int xe^x dx.$ **CO2**
8. Find the value of $\int_0^1 \frac{1}{1+x^2}dx.$ in the Fourier expansion of $y = x^2$ in the interval $x = 0$ **CO3**
9. Find the Fourier coefficients of $x = 1$ in the interval $y = \sin x$ **CO3**
10. Find the value of $x = 0$ in the half range cosine series of $x = \pi$ in the interval $\left(\frac{d^3y}{dx^3}\right)^2 - 3\left(\frac{dy}{dx}\right)^2 - x^2 = 1$ **CO3**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11. A) Solve $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ **CO 1**

Or

B) Solve $\left(x^2 + y\right)dx + \left(y^2 + x\right)dy = 0.$ **CO 1**

12. A) Solve $\int \frac{3x+1}{(x-1)(x+3)}dx.$ **CO1**

Or

B) Solve $\int \frac{1}{5+4\cos x}dx.$ **CO1**

13. A) Evaluate $\int x \sin 3x \cos x dx.$ **CO2**

Or

B) Evaluate $\int x^3 \cos x dx.$ **CO2**

14. A) Evaluate $\int_0^1 \frac{x^3}{1+x^8}\,dx.$ **CO2**

Or

B) Evaluate $\int_0^{\frac{\pi}{2}} \frac{1}{1+\tan^3 x}\,dx.$ **CO2**

15. A) Find $y^2 = 4x$ **CO2**

Or

B) Using convolution theorem find $x^2 = 4y$ **CO2**

PART-C

Answer the following question. Question carries TEN marks. 1x10=10M

16. Find the Fourier expansion of $\sqrt{27-4x^2}$ in the interval $x = 0$ and hence deduce that $x = 3$ **CO3**

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STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS – EE-401

TIME : 3 HOURS **MODEL PAPER- 2** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. Solve $\frac{x^2}{16}+\frac{y^2}{25}=1$ **CO 1**
2. Solve $\int_1^{11} x^3 dx$ **CO 1**
3. Find the particular integral of differential equation $2\sin x\frac{dy}{dx}-y\cos x=xy^3e^x$. **CO 1**
4. Find the particular integral of differential equation $\int\left(3e^x-2\cos x+\frac{3}{x}\right)dx$. **CO 1**
5. Find $\int\cos^2 2x dx$. **CO2**
6. Find $\int\frac{\tan^{-1}x}{1+x^2}dx$. **CO2**
7. Find $\int x\cos x dx$. **CO2**
8. Find the value of $\int_0^2\frac{1}{\sqrt{4-x^2}}dx$. in the Fourier expansion of $i=a\sin t$ in the interval $x^2+y^2=9$ **CO3**
9. Write Euler's formula of Fourier expansion of $x=0$ in the interval $x=2$ **CO3**
10. Find the value of $y=Ae^x+Be^{-x}$ in the half range cosine series of $\frac{dy}{dx}=e^{2x+y}$ in the interval $\frac{dy}{dx}+\frac{y}{x}=x$ **CO3**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11. A) Solve $\int\frac{1}{2x^2+3x+5}dx$. **CO1**

(Or)

B) Solve $\int\sin^3 x\cos^5 x dx$. **CO1**

12.A) Solve $\int e^x\left(\frac{2+\sin 2x}{1+\cos 2x}\right)dx$. **CO1**

(Or)

B) Solve $\int e^x\left(\frac{2+\sin 2x}{1+\cos 2x}\right)dx$. **CO1**

13.A) Evaluate $\int_0^1 \frac{\sec^2 x}{(1+\tan x)^2} dx.$ **CO2**

(Or)

B) Evaluate $\int_0^{\frac{\pi}{2}} \log(1+\tan\theta)\, d\theta.$ **CO2**

14.A) Evaluate $y = x^2$ **CO2**

(Or)

B) Using Laplace transforms evaluate $y = 3x + 4$ **CO2**

15.A) Find $\sqrt{\log x}$ **CO2**

(Or)

B) Using convolution theorem find $x = e$ **CO2**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16.Find the Fourier expansion of $x = e^2$ in the interval π and hence deduce that $\int_0^1 \frac{1}{1+x^2} dx$ **CO3**

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ELECTRICAL MACHINES-II (Transformers and alternators)

Course code	Course title	No.of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-402	ELECTRICAL MACHINES-II (Transformers and alternators)	5	75	20	80

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Single phase transformers	**30**	CO1
2	Three phase transformers and Auto Transformers	**15**	CO2
3	Alternators	**15**	CO3
4	Parallel operation of Alternators	**15**	CO4
Total		**75**	

Course Objectives:

Course Objectives	1) To familiarize with the knowledge of Transformers andAlternators 2) To understand the working of a three phasetransformers 3) To illustrate the parallel operation of Transformers andAlternators

Course outcomes:

Course outcomes	**CO1**	EE-402.1	Analyze the working of single transformers, equivalent circuit parameters, efficiency and regulation.
	CO2	EE-402.2	Explain three phase transformers for their efficiency.
	CO3	EE-402.3	Analyze the construction and working principle of Alternator.
	CO4	EE-402.4	Explain paralleling and synchronisation methods of Alternators.

Learning outcomes:

Single phasetransformer

1.1 Define Transformer and Explain its working principle.
1.2 Classify the transformers basedon
(i) numberofphases (ii)construction(iii)function.
1.3 Explain the constructional details oftransformers with legible Sketch..
1.4 Distinguish between shell type and core typetransformers.
1.5 Derive the E.M.F equation of a single phasetransformer and solve problems.
1.6 Define 'transformation'ratio.
1.7 Draw Vector diagram for a transformer working on noload.
1.8 Develop the vector diagram of a transformer on loadfor
(i) Unity powerfactor (ii) Lagging powerfactor (iii) Leading powerfactor
1.9 Draw the equivalent circuit of a transformer byapproximation.
1.10 Determine the equivalent circuit constants from no-load test and short circuit testdata and solve problems

1.11 Derive the approximate equation for regulation fortransformer at Unity, Lagging and Leading Power factors and solve problems.
1.12 List the losses taking place in atransformer and Derive the condition for maximum efficiency of atransformer.
1.13 State the reason for transformer rating inKVA.
1.14 Define all-day efficiency and solve problems for a load cycle.
1.15 Differentiate between distribution transformer and powertransformer.

Three Phase Transformers and Autotransformers

2.1 State the advantages of 3 phase transformer over single phasetransformer.
2.2 List the different types of three phase transformers by giving their symbolic representation and voltagerelationships.
2.3 State theapplicationsof(i)star-star(ii)delta-star(iii)star-delta (iv)delta- delta connected transformers.
2.4 State the need for parallel operation of Three phase transformers.
2.5 State the conditions for parallel operation of 3 phasetransformers.
2.6 List the specialtransformers.
2.7 State the advantages and disadvantages ofautotransformers
2.8 State the expression for saving of copper in autotransformer.
2.9 State the necessity of cooling of powertransformers.
2.10 Explain the methods of cooling of powertransformer.
2.11 Explain the function of each part in a power transformer
2.12 State the need for Tap changing in power transformer and explainthe`onload'and`off loadtapchanging.
2.13 Explain the procedure for tap changing for on load and no load tapchanger.

Alternators

3.1 Explain the Principle of working ofAlternators.
3.2 Describe the Constructional details of Alternators with legiblesketch.
3.3 Classify the Alternators based on rotorconstruction.
3.4 Explain the working of the Alternator having (i) CylindricalRotor (ii) Salient PoleRotor
3.5 State the advantage of StationaryArmature.
3.6 State the effect of Chording and Distributionfactor
3.7 Derive expressions for Chording factor and Distributionfactor
3.8 Derive EMF equation of an alternator taking into account distribution factor and pitch factor and solve problems
3.9 State the need for an exciter in anAlternator and list various types of exciters .
3.10 ExplainArmatureReactionofAlternatoratdifferentP.F's.
3.11 State the reasons for voltage variations onLoad.
3.12 Define the term synchronousimpedance and state its effects on operation of an alternator.
3.13 Define regulation of analternator
3.14 List the different methods of finding the regulation ofalternator.
3.15 Determination of regulation of Alternator by using synchronous impedance method.

Parallel operation ofAlternators

4.1 Explain the necessity for parallel operation ofalternators
4.2 State the conditions forsynchronisation
4.3 Explain the procedure of synchronisation by using lamps and synchroscopemethods.
4.4 Explain the method for adjusting the loads shared by two alternators (or one alternator withinfinite bus bar).
4.5 Explain the effect of change in input and excitation of an alternator connected to infinite bus.
4.6 Problems on abovetopics.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-402.1	3							3	1	
EE-402.2	3	2		1	1			3		
EE-402.3	3							3	1	
EE-402.4	3	2						3	1	
EE-402.5	3		2					3		
Average	**3**	**2**	**2**	**1**	**1**			**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENT

Single PhaseTransformers

Introduction to Transformer, Classification of transformers, Construction of transformers, Theory of an ideal transformer - emf equation derivation – Transformation ratio and turns ratio and relation between them - Voltage ratio and current ratio – Transformer on no load - No load current components and no load power factor -Transformer on load – Equivalent circuit of transformer - Equivalent circuit constants by transformation, Short circuit test - Regulation of transformer - definition and derivation of approximate equation for regulation based on vector diagram for lagging ,leading and unity power factors - determination of regulation from S.C. Test data , determination of losses in transformer from O.C. and S.C. tests data- efficiency, condition for maximum efficiency – rating of transformer-All day efficiency definition - Calculation for a given load cycle- problems.

Three- phase transformer & Autotransformer

Advantages of 3 phase transformer over single phase transformer. Descriptive treatment of star-star, delta-delta, star-delta and delta-star, voltage current and phase relation for the above groups- Need and conditions to be fulfilled for paralleling 3 phase transformer, open delta working of 3 phase transformers, Auto-transformers –expression for copper saving –

applications, Necessity of cooling - Methods of cooling – explain different parts and their functions in a power transformer- Tap changing gear - no load and on load tap changing procedure.

Alternators

Classification of alternators - Brief description of parts with sketches and function of each part, construction, Assembly - Exciter and pilot exciter – Stationary armature type construction – Advantages**,** Concentrated and distributed windings - short pitch and full pitch coils - Effect of chording and distribution factors - EMF equation - Derivation – Problems**,** Cause for variation of voltage on load - Resistance, leakage reactance - Armature reaction - Synchronous reactance and synchronous impedance concepts - phasor diagram for unity, lagging and leading power factor loads, Regulation - definition - derivation of relation between no load voltage and on load voltage for different power factors – Different methods of finding regulation- Determination of regulation of Alternator by using synchronous impedancemethod.

Parallel operation ofalternators

Necessity for parallel Operation - condition to be fulfilled for synchronisation, Synchronisation by lamps & synchroscope methods - Load sharing –Effect of change in excitation and input of an alternator connected to infinite bus-bar -Problems.

REFERENCE BOOKS:

1. B.L. Theraja,A.K.Theraja-A Textbook of Electrical Technology - Vol –II-S.Chand&Co.
2. M.G Say –ACmachines-Pitman publishers
3. D.P.Kothari, I.J.Nagrath – Electrical Machines-McGraw.Hill
4. P.S. Bhimbra-Electrical machinery– KhannaPublishers
5. M.V. Deshpande-Electrical machines –Wheeler publishers.
6. J.B.Gupta-Theory and performance of electrical machines-KATSON BOOKS
7. Audel-Electric motors-Rex Miller,Mark Richard Miller.

Blue print:

S.No.	Unit Title	No. of period s	Weightage allocated		Marks wise distribution of weightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1	Single phase transformers	30	25	*	6	11	8	*	2	2	1	*	CO1
2	Three phase transformers and Auto Transformers	15	14		3	3	8		1	1	1		CO2
3	Alternators	15	17	*	6	3	8	*	2	1	1	*	CO3
4	Parallel operationof Alternators	15	14		3	3	8		1	1	1		CO4
Total		75	70	10*	18	20	32	10*	6	5	4	1	

R - Remember; U - Understanding; Ap - Application; An – Analysing

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Syllabus for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test - I	From 1.1 to 2.8
Unit Test - II	From 2.9 to 4.6

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-402
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-402 : ELECTRICAL MACHINES – II (Transformers and Alternators)

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) For the step down Transformers The transformation ration is less than 1 : True / False.
   (b) The condition for maximum efficiency of Transformer is_____.
   (c) In the _____ type transformer construction the winding surrounds the core.
   (d) The rating of the Transformer is generally expressed in _____ **(CO1, CO2)**
2. Distinguish between shell-type and core-type transformers in any three aspects. **(CO1)**
3. Draw a neat vector diagram of a practical transformer working on No load. **(CO1)**
4. Differentiate between distribution and power transformer in any three aspects. **(CO1)**
5. State any three advantages of three phase Transformer over single phase transformer .**(CO2)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer**.

6. (a) Derive the EMF equation of a single-phase transformer. **(CO1)**

(or)

   (b) Draw the Vector diagram of a practical transformer on load for unity power factor and lagging power factor. **(CO1)**

7. (a) A 230/460 V , single phase Transformer has a primary resistance 0.2 ohm and reactance 0.5 ohm. The corresponding values for the secondary are 0.75 ohm and 1.8 ohm respectively. Find the secondary terminal voltage, when supplying 10 A at 0.8 p.f lag. **(CO1)**

(or)

(b) A 5 kVA transformer has 35 W core loss and 40 W copper loss at full load. It operates at rated kVA and 0.8p.f lagging for 6 hours, one-half ratedkVA and 0.5 pf lagging for 12 hours and no-load for 6 hours. What is the all-day efficiency. **(CO1)**

8. (a) State the need for parallel operation of Three phase Transformers and also state the conditions for parallel operation of three phase transformers. **(CO2)**

(or)

(b) State the expression for saving of copper in auto transformer and also write the advantages and disadvantages of auto transformers. **(CO2)**

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MODEL PAPER – FORMATIVE ASSESMENT-2

C-20-EE-402

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FOURTH SEMESTER EXAMINATION

EE-402 : ELECTRICAL MACHINES – II (Transformers and Alternators)

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**

ii. **First question carries four marks and remaining each question carries three marks.**

iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) Alternator is also called as Synchronous Generator : True / False.
   (b) Effect of armature reaction in an alternator at Z.P.F leading is _____.
   (c) Synchronous Impedance method is the optimistic method: True / False.
   (d) The formula used to calculate the frequency in terms of speed and poles is _____. **(CO3, CO4)**
2. Define Chording factor and Distribution factor of a Synchronous generator. **(CO3)**
3. Define Voltage Regulation of an Alternator. **(CO3)**
4. State the conditions for synchronization of an alternator. **(CO3)**
5. State the necessity for parallel operation of alternators. **(CO4)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**

ii. **Each question carries eight marks.**

iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer**.

6. (a) A 3-phase , 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slots. The flux per pole is 30 m wb sinusoidally distributed. Find the phase and line voltages if the speed is 375 rpm. **(CO3)**

(or)

(b) Explain armature reaction of Alternator at different power factors. **(CO3)**

7. (a) Explain the procedure of synchronization of alternators using Dark lamp and Bright lamp method **(CO4)**

(or)

(b) Two 25 MVA, 3-phase alternators operate in parallel to supply a load of 35 MVA at 0·8 p.f. lagging. If the output of one machine is 25 MVA at 0·9 p.f. lagging, find the output and p.f. of the other machine. **(CO4)**

8. (a) State the need for parallel operation of three phase alternators and also state the conditions for parallel operation of three phase alternators. **(CO4)**

(or)

(b) Derive expressions for Chording factor and Distributionfactor of an alternator. **(CO3)**

***

MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-402
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-402 : ELECTRICAL MACHINES – II (Transformers and Alternators)

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. Answer all questions.
ii. Each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. Distinguish between shell-type and core-type transformers in any three aspects. **(CO1)**
2. Draw a neat vector diagram of a practical transformer working on No load. **(CO1)**
3. Differentiate between distribution and power transformer in any three aspects. **(CO1)**
4. State any three advantages of three phase Transformer over single phase Transformer.**(CO2)**
5. State the conditions for parallel operation of 3-phase transformer. **(CO2)**
6. State the need of an exciter in an alternator **(CO3)**
7. Define Chording factor and Distribution factor of a Synchronous generator. **(CO3)**
8. Define Voltage Regulation of an Alternator. **(CO3)**
9. State the conditions for synchronization of an alternator. **(CO3)**
10. State the necessity for parallel operation of alternators. **(CO4)**

PART-B **5 X 8 = 40**

Instructions:

i. Answer all five questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. (a) Derive the EMF equation of a single-phase transformer. **(CO1)**

(or)

(b) Draw the Vector diagram of a practical transformer on load for unity power factor and lagging power factor. **(CO1)**

12 (a) A 230/460 V , single phase Transformer has a primary resistance 0.2 ohmand reactance 0.5 ohm. The corresponding values for the secondary are 0.75 ohm and 1.8 ohm respectively. Find the secondary terminal voltage, when supplying 10 A at 0.8 p.f lag.**(CO1)**

(or)

(b) A 5 kVA transformer has 35 W core loss and 40 W copper loss at full load. It operates at rated kVA and 0.8p.f lagging for 6 hours, one-half rated kVA and 0.5 pf lagging for 12 hours and no-load for 6 hours. What is the all-day efficiency? **(CO1)**

13. (a) Draw a legible sketch of Power transformer and explain the function of each part .**(CO2)**

(or)

(b) Explain any two methods of cooling of power transformers **(CO2)**

14. (a) A 3-phase , 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slots. The flux per pole is 30 m wb sinusoidally distributed. Find the phase and line voltages if the speed is 375 rpm. **(CO3)**

(or)

(b) Explain armature reaction of Alternator at different power factors. **(CO3)**

15. (a) Explain the procedure of synchronization of alternators using Dark lamp and Bright lamp method**(CO4)**

(or)

(b)Two 25 MVA, 3-phase alternators operate in parallel to supply a load of35 MVA at 0·8 p.f. lagging. If the output of one machine is 25 MVA at 0·9 p.f. lagging, find the output and p.f. of the other machine. **(CO4)**

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**

ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. What is the effect of power factor on voltage regulation of transformer when the load is (a) resistive (b) inductive (c) capacitive. **(CO1)**

***

POWER SYSTEMS – II(TRANSMISSION AND DISTRIBUTION)

Course code	Course title	No.of periods/week	Total no. of periods	Marks for FA	Marks forSA
EE-403	POWER SYSTEMS – II (TRANSMISSION AND DISTRIBUTION)	4	60	20	80

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Transmission lines	**18**	**CO1**
2	HVDC transmission	**03**	**CO1**
3	Line structures for transmission and Distribution	**17**	**CO2**
4	Cables	**6**	**CO3**
5	Substations	**7**	**CO4**
6	Distribution	**9**	**CO5**
Total Periods		**60**	

Course Objectives	To understand the concept of transmission anddistribution To Analyse different methods to solve transmission and distribution problems To acquaint knowledge of substation equipment, cables and Distribution systems

Course outcomes	**CO1**	EE-403.1	Design T and pi networks for finding different parameters of transmission lines and interpret the concept of HVDC transmission system.
	CO2	EE-403.2	Explain different structures, insulators , laying of lines including the calculations of string efficiency and Sag
	CO3	EE-403.3	Explain different types of cables
	CO4	EE-403.4	Explain various substations and different parts of Substations
	CO5	EE-403.5	Analyse various AC Distribution systems

LEARNING OUTCOMES

Transmission Lines

1.1 State the need of transmission lines and distributionlines

1.2 Explain A.C and D.C transmission supplysystems and state its advantages and disadvantages

1.3 State the supply systems based on the conductor material required for overhead lines and undergroundcables

(i) AC - 1 ph 2 wiresystem

(ii) AC - 3 ph 3 wiresystem

(iii) DC – 2 wiresystem

1.4 Explain the effects of supply frequency on Transmission lines

1.5 Explain the effect of voltageon
(i) Lineefficiency (ii)Voltage drop iii)Line loss
(iv)Active &reactivePower (v)Volume of conductor material
(vi)Cost of-transformers, insulators, switchgear, supportsetc.

1.6 State the empirical formula for determining the systemvoltage

1.7 State the type of transmission lineconductors with relative merits
a) Solid b)Stranded c)Hollow d) Bundledconductors

1.8 Explain the current distortioneffects
(i) Skineffect (ii)Proximityeffect (iii)Spirality effect

1.9 Derive expression for inductance of 1- phase system

1.10 Give the expression for the inductance of 3 phase symmetrical and asymmetrically spaced round conductors (No derivation)

1.11 State the need for transposition of overheadlines and explain its effects.

1.12 Derive the expressions for capacitance of1 phase system

1.13 Give the expressions for capacitance of 3 phase symmetrically spaced, asymmetrically spaced and transposed lines round conductors (No-Derivation)

1.14 Define short, medium and longlines.

1.15 State the reasons for the consideration of lumped parameters in short and medium transmissionlines.

1.16 Define`regulation', percentageregulation and derive the approximate formula for percentageregulation..

1.17 Compute the following for shortline and solve problems,
(i) Sending endvoltage (ii) Sending endP.F (iii) percentageregulation
(iv) Efficiency for the given receiving endcondition

1.18 Compute the percentage regulation, efficiency of medium transmission lines with given receiving end conditions and line parameters and solve problems using
(i) Nominal T-method (ii) Nominal π –method

1.19 Explain the charging current in lines and power loss due toit

1.20 State `Ferranti'effect and derive the expression for rise in voltage at the receivingend.

1.21 Define Corona, State the factors affecting it

1.22 Explain the concept and applications of hot linetechnique

HVDCtransmission

2.1 State basic concepts of HVDCtransmission

2.2 List the types ofHVDC transmission systems.

2.3 Discuss the advantages and disadvantages of HVDCtransmission

2.4 Know the location of HVDC Projects inIndia.

Line structures for transmission andDistribution

3.1 State the main components of overheadlines

3.2 State the requirements of linesupports

3.3 List the factors influencing the selection of the linesupports

3.4 List the types of linesupports and State their advantages and disadvantages.

3.5 State the need for cross arms and mention its economical spacing ofconductors.

3.6 State the factors on which the conductor spacing and ground clearancedepend

3.7 List the common conductor spacing and ground clearances adoptedfor

(i) 66KV (ii) 33KV(iii) II KV (iv)L.T.lines

3.8 List the Maximum earth resistance value together with the size of pipe or plate used for Earthing.

3.9 Define`sag' and state the factors affecting thesag

3.10 Derive an equation for the approximate method of calculating sag and solve problems.

(i)when the supports are at the samelevel(a) instillair(b) with the effect of wind andice

(ii) when the supports are at different levels

3.11 State the disadvantages of loose spans(sag more than prescribedvalue)

3.12 State the purpose of insulators and its requirements.

3.13 State applications of the followinginsulators.

(i) Pintype (ii)Straintype (iii)Suspensiontype(iv)Shackletype

3.14 Comparison pin type insulator and suspension typeinsulators.

3.15 Define theterms (i)Flashover (ii)Puncture (iii)String-efficiency

3.16 Solve problems on distribution of voltage acrossstring and stringefficiency

3.17 State the methods of improving stringefficiency

(i) By eliminating groundcapacitance (ii) By grading of theunits

(iii) Static shielding(guardring)

3.18 State the need for arcing horns and guardrings

3.19 List causes of failure of insulators in transmission and distributionlines

UndergroundCables

4.1 Definecables and explain the general construction of cables.

4.2 Compare overhead lines with undergroundcables

4.3 State the classification of cables basedon

(i) Number ofconductors (ii) Voltage (iii) Insulation and leadsheathing

(iv) The methods of improving the dielectricstress

4.4 Describe the construction of different types ofcables

(i) Lowvoltage cables (ii) H.T cables(iii) Supertensioncables (iv) EHVcables

4.5 Derive an equation for the insulation resistance of acable

4.6 Solve problems on insulationresistance.

Substations

5.1 Explain the need forsubstations

5.2 State the relative merits of indoor substation ,outdoor substation and Gas insulated Substations overothers.

5.3 List the equipment used insubstation.

(i) Busbars (ii)Insulators (iii)Transformers

(iv)Switchgear (v)Indicating and Meteringequipment (vi)Protectiverelays

(vii)Lightningarrestors (viii) Cables (ix)Fire fightingequipment

5.4 State the purpose of each of the aboveequipment.

5.5 Explain Substation auxiliarysupply

Distribution

6.1 Distinguish between primary distribution and secondarydistribution

6.2 Explain Feeder, distributors and servicemains

6.3 Classify the type of distribution systems accordingto

(i) Type ofcurrent(ii)Construction

(iii)Service (iv)Number ofwire (v)Scheme ofconnections

6.4 List the type of distributionsystems

(i) Radialand (ii) Ring mainsystems

6.5 State the advantages and disadvantages of the followingsystems

(i) Radial and (ii) Ring mainsystems

6.6 List the steps involved in the voltage drop calculations in A.C. single phasedistributors

6.7 Solve simple problems on voltage drop calculations in A.C. single phase Distributors(single fedsystems with power factor referred to end point.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-403.1	3		1	1				3	1	
EE-403.2	3	2						3	1	
EE-403.3	3		1					3	1	
EE-403.4	3							3	1	
EE-403.5	3	2	1	1				3	1	
Average	3	2	1	1				3	1	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATEDCOURSE CONTENTS

1. Transmission Lines-Need for transmission lines-Transmission supply systems, Relative advantages and disadvantages of AC & DC Transmission, Choice of frequency, Choice of voltage, Effect of voltage, Empirical formula for determining the system voltage, H.V.D.C. power Transmission, Operational techniques of H.V.D.C, Requirements of conductor material - Types of conductor-Solid-Stranded-Hollow- Bundled conductors -Relative merits of different types of conductors-Transmission parameters: Resistance, Inductance capacitance-skin effect, proximity effect, spirality effect-Determination of inductance of Round and Parallel Conductors ,Transposition of O.H. lines-Effect of transposition on Inductance calculations in transposed lines, Calculation of capacitance in round and parallel conductors -Regulation and % Regulation-Approximate formula for Regulation-Short line calculation of-Efficiency-Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions -Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions in medium transmission lines using

Nominal pie method-Nominal T method -Vector diagrams in the above methods-Charging current in lines-Ferranti's effect- Carona in transmission lines-Power loss due to corona-Effects of corona-Methods of reducing corona - Hot line technique - concept andapplication

2. High voltage DC Transmission: Basic Concepts and Types of HVDC transmission- HVDC projects in India - Advantages and disadvantages of HVDCtransmission.

3. Line structure for Transmission and Distribution:

Requirements of line supports, Factors influencing the selection of line support-Types of lines supports-Foundation for poles Descriptive treatment- Cross arms for L.T and H.T lines up to 33 KV- Pole guys- Conductors spacing and ground clearance-Methods of earthing- L.T., 11 KV and33 KV lines-Max. earth resistance-Types of towers used for 66 KV and 132 KV and 220KV400kvlines spaces-Approximate ground clearance- Sag, Factors affecting sag, calculating sag. Disadvantages of loose span, stringing charts, Insulators, Requirements of insulators , Materials used , Types of Insulators, Voltage distribution across string of suspension Insulators, Flashover, Puncture, string efficiency, improving string efficiency, eliminating the ground capacitance, grading, static shielding , Arcing horns and guard rings, Causes for failure ofinsulators

4. Cables

Cables, Comparison between O.H. Lines and underground cables, Classification of cables, General construction of cables, Types of cables, Insulation resistance of cables and problems.

5. Sub-stations

Definition and classification of sub-stations, Relative merits of indoor and outdoor sub- stations equipment in sub-stations Bus-bars, Insulators, Switch gear, Transformer, Protective relays, Meters, Lightning arrestors, Cables, Fire fighting equipment, Bus bar arrangements.

6. Distribution

Primary and secondary distribution, Feeders, distribution and service mains, Classification of Distribution systems, Radial and Ring system of Distribution, A.C. Distribution(single phase), Steps in voltage drop calculation – solve simple problems.

Reference Books:

1. V.K. Mehta& Rohit mehta -Principles of Powersystems-S.Chand& co.
2. Dr.S.L. Uppal,Prof.S.Rao– Electricalpower systems-Khanna publishers
3. M.L.Soni,P.V.Gupta&U.S.Bhatnagar–A Text book on Power Systems Engineering-Dhanpat Rai &co.Pvt.Ltd.
4. CL Wadhwa -Electrical power Systems - New Age International(P)ltd.publishers
5. KR Padiyar - HVDC Power Transmission system Technology- New Age International(P)ltd.publishers.

Blue print:

S.No.	Chapter title	No. of periods	Weightage allocated		Marks wise distribution of weightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1	Transmission lines	**18**	**17**	*	3	6	8	*	1	2	1	*	**CO1**
2	HVDC transmission	**03**	**3**		3	0	0		1	0	0		**CO1**
3	Line Structures for Transmission and Distribution	**17**	**17**	*	6	3	8	*	2	1	1	*	**CO2**
4	Cables	**6**	**11**		3	0	8		1	0	1		**CO3**
5	Substations	**7**	**11**		3	0	8		1	0	1		**CO4**
6	Distribution	**9**	**11**	*	3	0	8	*	1	0	1	*	**CO5**
Total		**60**	**70**	**10***	**21**	**9**	**40**	**10***	**7**	**4**	**4**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test - I	From 1.1 to 3.10
Unit Test - II	From 3.11 to 6.7

MODEL PAPER – FORMATIVE ASSESMENT-1

C-20-EE-403

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FOURTH SEMESTER EXAMINATION

EE-403 : POWER SYSTEMS – II (Transmission and Distribution)

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**

ii. **First question carries four marks and remaining each question carries three marks.**

iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) If transmission line voltage increases, then the efficiency of line becomes _____ .
   (b) Stranded conductors are used in transmission line: True / False
   (c) Write the formula for line capacitance of transmission line _____ .
   (d) Transposition of lines improves the transmission line efficiency: True / False **(CO1)**
2. Define corona. **(CO1)**
3. State the advantages of HVDC transmission lines. **(CO1)**
4. List the factors affecting corona. **(CO1)**
5. List any six requirements of line supports. **(CO2)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**

ii. **Each question carries eight marks.**

iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Derive an expression for inductance of a single phase transmission line. **(CO1)**

   (or)

   (b) A three phase short transmission line with an impedance of 6+j8 ohm per phase as sending end and receiving end voltage of 120 kV which is operating at a power factor of 0.9 lagging. Determine (i) power output (ii) sending end power factor. **(CO1)**

7. (a) State the factors affecting corona and the methods to reduce the same. **(CO1)**

   (or)

   (b) Derive the expression for computing regulation and efficiency of medium transmission line using nominal T-method. **(CO1)**

8. (a) State the advantages and disadvantages of steel towers. **(CO2)**

   (or)

   (b) Derive an expression calculating sag of a transmission line when the line supports are different levels. **(CO2)**

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C-20-EE-403

MODEL PAPER – FORMATIVE ASSESMENT-2

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FOURTH SEMESTER EXAMINATION

EE-403 : POWER SYSTEM – II (TRANSMISSION & DISTRIBUTION)

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all **five** questions.
ii. First question carries **four** marks and remaining each question carries **three** marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) String efficiency in insulator is defined as the ratio of _____.

   (b) Insulation Resistance of cables will be in _____ Ω.

   (c) Electric Substations are used for switching On and OFF purpose : **True / False**.

   (d) Radial distribution system is used to minimize the line Voltage drop : **True / False.**

(CO2,CO3,CO4,CO5)

2. State the disadvantages of Loose spans. **(CO2)**

3. Distinguish Overhead lines and Underground Cables in any three aspects. **(CO3)**

4. State the functions of Substations. **(CO4)**

5. State the advantages and disadvantages of Ring Main distribution System. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all **three** questions.
ii. Each question carries **eight** marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) An insulator string consists of 3-Units, each having a safe working Voltage of 15KV. The ratio of Self-Capacitance to shunt Capacitance of each unit is 8:1. Find the maximum safe working Voltage of String. Find the string efficiency . **(CO2)**

   (or)

   (b) Explain methods of Improving String efficiency. **(CO2)**

7. (a) Derive an expression for insulation resistance of a cable. **(CO3)**

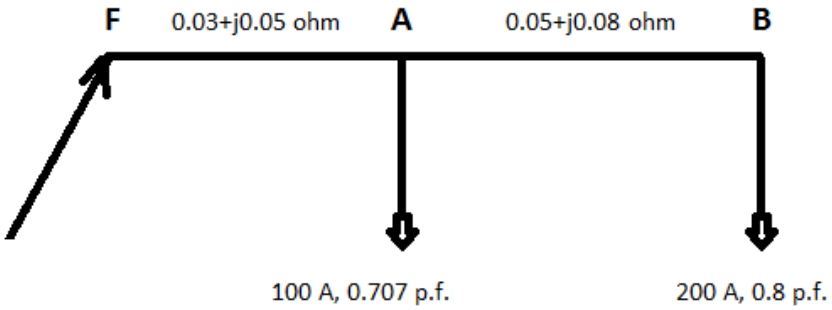
   (or)

   (b) State and Explain the use and application of substation equipment. **(CO4)**

8. (a) Explain the advantages and disadvantages of radial and ring main distribution systems. **(CO5)**

(or)

(b) A two wire AC feeder is loaded as shown in figure. The power factors are lagging and are referred to the voltage at end point. If the voltage at the far end is to be maintained at 230 V, calculate the voltage at supply end. **(CO5)**



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MODEL PAPER – SUMMATIVE EXAMINATION

C-20-EE-403

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FOURTH SEMESTER EXAMINATION

EE-403 : POWER SYSTEMS – II (Transmission and Distribution)

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. Answer all questions.

ii. Each question carries three marks.

iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. List any six advantages of AC transmission system. **(CO1)**
2. List the types of HVDC transmission system. **(CO1)**
3. List the factors affecting corona. **(CO1)**
4. List any three applications of hot line technique. **(CO1)**
5. State the causes for the failure of insulators. **(CO2)**
6. Define string efficiency. **(CO2)**
7. State the factors influencing the selection of line supports. **(CO2)**
8. Distinguish overhead lines with underground cables in any three aspects. **(CO3)**
9. Define substation and state its functions. **(CO4)**
10. State the advantages of radial distribution system. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. Answer all five questions.

ii. Each question carries eight marks.

iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. (a) A three phase short transmission line with an impedance of 6+j8 ohm per phase as sending end and receiving end voltage of 120 kV which is operating at a power factor of 0.9 lagging. Determine (i) power output (ii) sending end power factor. **(CO1)**

(or)

(b) A three phase 50 Hz 150 km line has a resistance, inductive reactance and shunt admittance 0.1 ohm, 0.5 ohm and $3x10^{-6}$ mho per km per phase respectively. If the line delivers 50 MW at 110 kV and 0.8 p.f. lagging. Determine the sending end voltage and current. Assume nominal π circuit for the line. **(CO1)**

12. (a) Derive an expression for calculating the sag of a transmission line when the line supports are at same level. **(CO2)**

(or)

(b) An insulator string consists of three units each having a safe working voltage of 15 kV. The ratio of self capacitance to shunt capacitance of each unit is 8:1. Find the maximum safe working voltage of string and string efficiency. **(CO2)**

13. (a) Explain the basic construction of cable with diagram. **(CO3)**

(or)

(b) Derive an expression for insulation resistance of a cable. **(CO3)**

14. (a) State the merits and demerits of indoor substation over outdoor substation. **(CO4)**

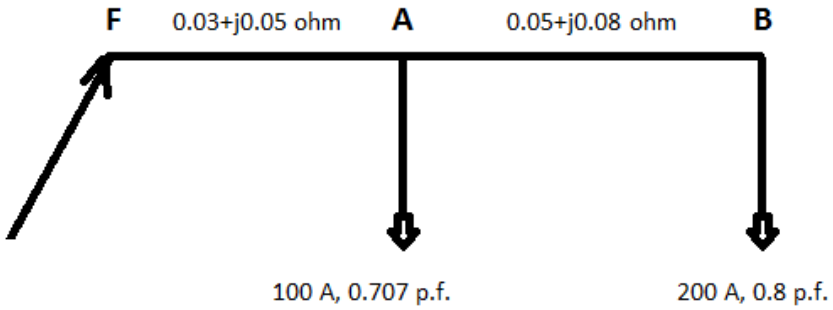
(or)

(b) List the equipment used in substation and explain the purpose of each equipment.**(CO4)**

15. (a) Explain the advantages and disadvantages of radial and ring main distribution systems. **(CO5)**

(or)

(b) A two wire AC feeder is loaded as shown in figure. The power factors are lagging and are referred to the voltage at end point. If the voltage at the far end is to be maintained at 230 V, calculate the voltage at supply end. **(CO5)**



PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**

ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. Suddenly the receiving end voltage rises to a value which is more than sending end.why does this happen in transmission lines. **(CO1)**

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ELECTRICAL INSTALLATION AND ESTIMATION

Course code	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-404	ELECTRICAL INSTALLATION AND ESTIMATION	4	60	20	80

S. No.	Unit Title	No.of Periods	CO'S Mapped
1	Wiring Systems and Safety Procedures	9	CO1
2	Estimation of Lighting and Power Loads	23	CO2
3	Estimation of OH Lines and Earthing systems	20	CO3
4	Departmental Test, REC and Electrical Act 2003,	8	CO4
Total		60	

Course Objectives:

Course Objectives	(i) To understand different wiring tools, wiringsystem (ii) To know the safety precautions, Electrical ACT- 2003 and departmental procedure for acquiring electricalconnection. (iii) To estimate the cost of domestic installations,industrial installations of electrical equipment and earthing.

Course outcomes:

Course outcomes	**CO1**	EE-404.1	Give the specifications of various wiring systems and safety procedure.
	CO2	EE-404.2	Estimate the materials required and their cost in domestic installation and power wiring installation.
	CO3	EE-404.3	Estimate the electrical materials required for OH lines, Earthing systems.
	CO4	EE-404.4	Explain the knowledge on safety precautions, Electrical ACT- 2003 and departmental procedure for acquiring electrical connection. Calculation of Transformer components for Rural electrification

Learning Outcomes:

Wiring systems and safetyprocedures

1.1 Mention the use of wires and cables, Types of Installations and wiringAccessories**.**
1.2 Compare VIR, CTS, PVC, Lead Sheathed, Weather proof aluminium and copperwires.
1.3 Mention the uses of cables LV, HV, EHV and oil filled H types, SL, HSL and types of 3-phase cables
1.4 State the uses of standard wiregauge.
1.5 Specify the gauge of wire and number of strands in a multi strand wire by giving itscurrent carryingcapacity
1.6 Explain (i) C.T.S system (ii) T.R.S. system, (iii) Surface conduit system (iv) Concealed wiring system.
1.7 List the MainSwitches as:
(i) Double pole iron clad(DPIC) (ii) Triple pole iron clad(TPIC)
(iii) Triple pole iron clad with neutral link(TPICN)
(iv) Distribution fuse boardIronclad
(v) MCB types with specifications, MCCB, ELCB and RCCB and specify theirapplications.
1.8 List the different types of fuses as
(i) Rewirablefuses(ii) Open type fuses (iii) Kit Kattypefuses
(iv) Cartridgefusesand specify the fuse carrier material used, ratings and their usage.
1.9 State the reasons for fire accidents in Electricalsystem.
1.10 Discuss the reasons for not using fuse in Neutralwire
1.11 Describe the procedure of first aid for shock treatment to an electrocutedperson.
1.12 Explain the effects of shock andelectrocution.

Estimation of Lighting and PowerLoads

2.1 Define service mains and explain different types of servicemains
2.2 Select the service main suited to the givensituation
2.3 State the merits and demerits of different systems of interiorwiring.
2.4 Select the type of wiring system suitable to the givensituation
2.5 List the electrical material used in wiring the servicemains.
2.6 List the schedule of rates used in preparingestimate
2.7 Estimate the material requirement for indoor wiring given the plan of abuilding.
2.8 Draw the wiring layout for a big officebuilding, workshop/ ElectricalLaboratory and big Industries.
2.9 Draw the wiring layout and estimate the material required for a Residential Building with 2 bed roomhouse.
2.10 Prepare layout and draw single line wiring diagrams as per standard practice for a given set of machines in aworkshop.
2.11 Calculate the wire sizes for variousload circuits.
2.12 Specify important materials used under givencondition and estimate the quantity of material.
2.13 Prepare the estimate of the complete installation as per standardpractice
2.14 Select the type of wiring and service mains used for the irrigation pumpset.
2.15 Specify the materials used in the execution of the irrigation pump setinstallation.
2.16 Prepare an estimate for electrifying the irrigation pump setscheme
2.17 Prepare estimation for submersible pumpinstallation

Estimation of OH Lines and Earthingsystems

3.1 Calculate the total number of insulators required for the givenscheme
3.2 Select the type of insulators to be used for over headlines.
3.3 Select the type size and number of cross arms required for the overheadline
3.4 Determine the size and total length of overhead conductor required for the line givingdue Consideration for the sag to be allowed
3.5 Estimate the quantity of all materials required for given 11 kV and 400V overhead lines as per standard practice followed byNEC
3.6 Draw plinth and Pole Mounted transformersubstation
3.7 Select supporting poles of suitable size and height to install a given transformer as per Standard practice inNEC
3.8 Estimate the quantity of all the electrical accessories and components required for the given
(i) Pole mounted transformer (ii) Plinth mounted transformer
including the operating mechanism as per standard practice inNEC
3.9 State the purpose of Earthing and types that are normallyused.
3.10 Select the suitable type of Earthing for a given installation as perIS3043.
3.11 Specify the different components used in electrical Earthing of a giveninstallation
3.12 List the materials that are to be used in the earth pit surrounding the earthelectrode
3.13 Draw and explain pipe and plateEarthing
3.14 Estimate the materials required for pipe and plateearthing.

Departmental Test, REC and Electrical Act2003

4.1 Describe the departmental procedure for obtaining a serviceconnection
4.2 Specify insulation resistance desirable for a given electricalinstallation
4.3 Specify the value of earth resistance to be maintained for a given electrical Installations
4.4 List different tests to be conducted before energizing a newly constructed electrical installation.
4.5 Describe the test procedure for continuity of wiring in an electricalinstallation.
4.6 Explain the procedure for conducting insulation test of domesticwiring
4.7 Survey the load particulars in a villagefor
(i) Domestic (ii)industrial (iii) agriculturalloads.
4.8 Calculate the capacity of a transformer required assuming suitable diversityfactor
4.9 Determine the location point of transformer and calculate the tail end voltage regulations as per the practice inNEC.
4.10 Determine the economic feasibility of the scheme as per the standard norms fixed by REC to execute thescheme.
4.11 State major rules applicable to electrical installations as per Electrical act2003
4.12 Write as per the Electrical act 2003, the rules and procedures to be adopted during execution of the following electricalinstallations.
(i) Domestic lighting&Power (ii) Industrial
4.13 State the standards and code of practice followed by NEC in respect of electrical installations and OH lines of 11 kV and 400V pole mounted and Plinth mounted transformers.
4.14 State new I.E. Rules relating to safety and electric supply given by the Central Electricity Authority-2010.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-404.1	3							3	1	
EE-404.2	3							3		
EE-404.3	3				2			3	1	
EE-404.4	3	2	1					3	1	
EE-404.5	3	1	2	2	1			3	2	
Average	**3**	**1.5**	**1.5**	**2**	**1.5**			**3**	**1.2**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATEDCOURSE CONTENT

Wiring Systems and SafetyProcedures

Introduction, size of wires, standard wires, types of wires, CTC, PVC, Lead sheathed .VIR, weather proof wires, flexible wires different types of cable wires – Types and Installation of House Wiring Systems & Wirings Accessories : Methods of installing wiring, clips, screws -round blocks switch boards, sockets socket pins - CTS wiring - Installation of surface conduit wiring - Rigid conduits, flexible conduits - Conduit accessories - elbows bushings - reducers, conduit box saddles, PVC conduit wiring - Concealed wiring - Comparison of various wiring systems -- Distribution fuse boards - Main switches – Different types of fuses and fuse carriers - Safety procedures - Electric shock and first aid, causes for fire hazards in Electricalinstallations.

Estimation of Lighting and powerloads

Estimation of domestic lighting installation service main - types of wire - specification - quantity of materials required for service main – estimation and selection of interior wiring system suitable to a given building - number of circuits - calculation of length of wire and quantity of accessories required - estimates of materials for execution of the domestic wiring installation as per National Electrical act 2003 .Power wiring installation Drawing wiring layout for a big office building, electrical laboratory, big industry and a residential building with 2 bed room house.- estimation and costing upto 20 kVA calculation of load current based on ratings of various equipment'stobeinstalled-sizeofwire-lengthofwirenumberofcircuits – quantityofaccessories for execution of work as per standardpractice - Irrigation pump installation - Estimation upto 10 HP service main - type- calculation of size and quantity of wire and other components required - Labour cost for erection - Type of starter and control panel - accessories quantity and estimation Estimate for the installation of submersible pump.

Estimation of OH Lines andEarthing

Distribution lines of 11 kV and 400Volt OH lines - estimation only -quantity of materials required for lines of length 1 km - of number of poles - Cross arms clamps - insulators - conductor length and size for a given power transmission Distribution transformer erection- Estimation of quantity of materials required for structures, isolators - HG fuse operating mechanism, isolators, lightening arrestors for pole mounted substation and plinth mounted substation Quantity estimation for materials required in electrical Earthing both for pipe earthling and plate Earthing suitable to the given equipment or transformer substation

Departmental Tests and REC and Electrical Act2003

Electrical installation testing - departmental procedure for testing before giving service connection - departmental procedure for obtaining service connection - desirable insulation resistance for domestic and power circuits - Tests for measuring insulation resistance - procedure for conducting insulation resistance test and continuity tests, earth continuity test - Design of rural electrification scheme - Load survey-determination of capacity of transformer - estimation of quantity of materials required for the erection of distribution lines and11 kV feeder from a nearby 11 kV feeder - determining the economic feasibility of the scheme as per the procedure laid out in NEC, - Extracts from Indian Electricity rules 1956 and code of practice by NEC regarding - domestic power, agricultural industrial wiring installations, erection of 11 kV, 400 Volt distribution lines - pole mounted transformer – New I.E. Rules

REFERENCE BOOKS:

1. G.C Garg &S.L.Uppal-Electrical Wiring ,Estimating & costing-Khanna publishers
2. J.B.Gupta–A Course in Electrical Installation Estimating &costing-KATSON BOOKS
3. BVS Rao -Maintenance and Operation of Electrical Equipment – Vol-I-TMH
4. S. Rao -Testing, Commissioning Operation & Maintenance of Electrical equipment– Khanna publishers
5. Surjith Singh- Electrical Estimating & costing-Dhanpat Rai & Co.
6. K.B.Raina,Dr. S.K.Bhattacharya-Electrical Design,Estimating and costing- New Age International(P)ltd.publishers.

Blue print:

S.No.	Unit Title	No. of periods	Weightage allocated		Marks wise distribution of weightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1	Wiring Systems and Safety Procedures	9	14		3	11	0		1	2	0		CO1
2	Estimation of Lighting and Power Loads	23	25	*	6	3	16	*	2	1	2	*	CO2
3	Estimation of OH Lines and Earthing	20	17	*	3	6	8	*	1	2	1	*	CO3
4	Departmental Test, REC and Electrical Act 2003,	8	14		6	8	0		2	1	0		CO4
Total		**60**	**70**	**10 ***	**18**	**28**	**24**	**10***	**6**	**6**	**3**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model Papers:Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 2.13
Unit Test-II	From 2.14 to 4.14

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-404
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-404 : ELECTRICAL INSTALLATION AND ESTIMATION

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.
ii. First question carries four marks and remaining each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) State the full form of VIR related to cables.
   (b) The fuse is made of _____material.
   (c) The line that brings electrical energy from the supplier's distributing line to the consumer premise is known as service line. (True/False).
   (d) As per IE rules, the total load in any sub-circuit in lighting load should not exceed _____ watts. **(CO1, CO2)**
2. State the uses of standard wire gauge. **(CO1)**
3. State the effect of electric shock. **(CO1)**
4. Draw the wiring layout for a electrical laboratory. **(CO2)**
5. Calculate the size of the cable required for 10 HP, 415 V, 3-phase, 50 Hz squirrel cage induction motor. Assume efficiency of the motor as 85% and power factor as 0.8 lagging. **(CO2)**

PART-B **3 X 8 = 24**

Instructions:

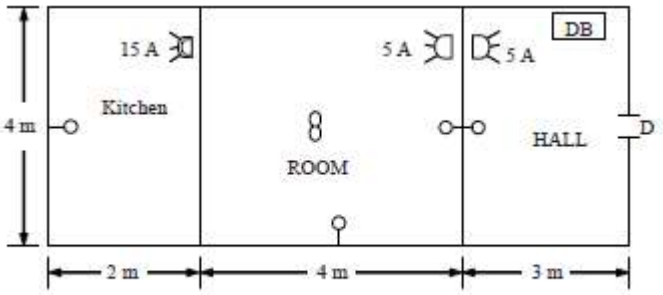
i. Answer all three questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain CTS system of wiring with legible sketches. **(CO1)**

(OR)

   (b) Explain surface conduit PVC wiring system with legible sketches. **(CO1)**

7. (a) The plan of a residential building is shown in Fig. It is to be provided with CTS system of wiring. Estimate the materials required and its cost. Wattage of Lamps = 60 W, Fan = 80 W, 5 A socket = 100 W, 15 A socket = 1000 W. Assume any missing date. **(CO2)**



Fig

(OR)

(b) List various materials required for Conduit wiring system. **(CO2)**

8. (a) A 10 H.P (metric), 415 V, 3-phase, 50 Hz squirrel-cage Induction motor is to be installed in a floor mill, the plan of which is shown in Fig. Show the layout of wiring diagram and estimate the quantity of materials required and their approximate cost. Assume any missing data. **(CO2)**

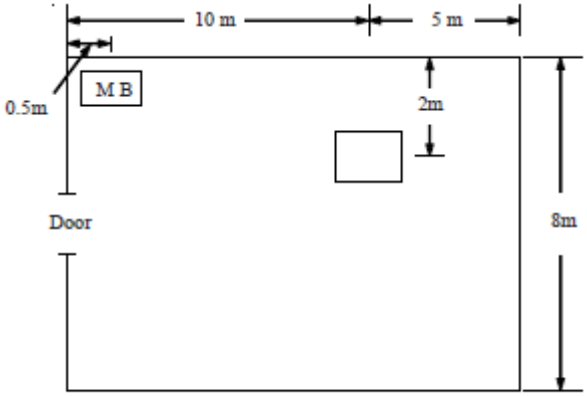


Fig 2.23 : Layout of Floor Mill

(OR)

(b) A 400V, 3-Ø, 2 no's induction motors are to be installed in a workshop as shown in Fig. Prepare a schedule with quantity of material and its approximate cost. Draw a wiring layout. Assume missing data, if any. **(CO2)**

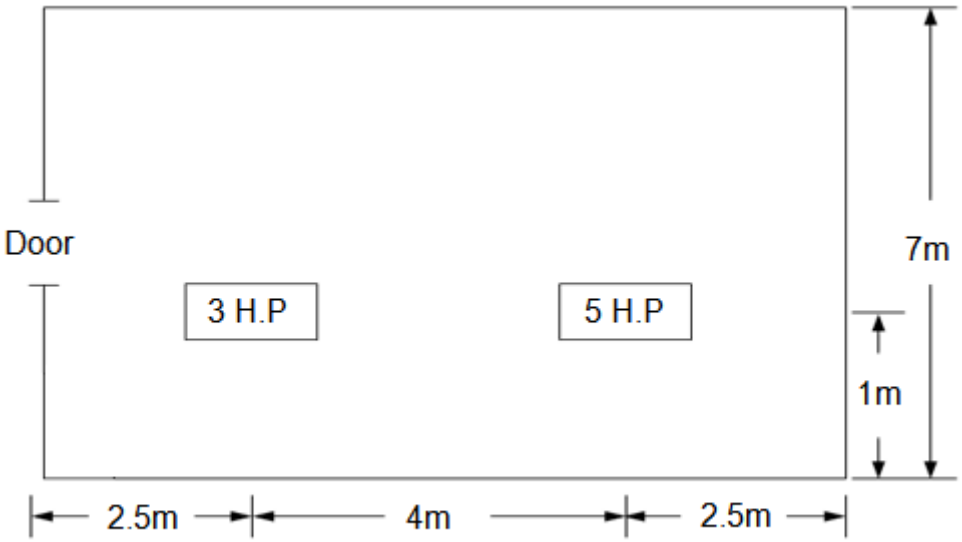


Fig.

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UNIT TEST II - MODEL PAPER – FORMATIVE ASSESMENT-2

C-20-EE-404

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FORTH SEMESTER EXAMINATION

EE-404 : ELECTRICAL INSTALLATION AND ESTIMATION

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.
ii. First question carries four marks and remaining each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) The wiring used in irrigation pump set is _____.
   (b) The insulator used in dead ends of LT live is _____.
   (c) The type of fuse used in 11 KV side of a pole mounted transformer is known as HG fuse. True / False.
   (d) The value of earth resistance to be maintained in power plants is ____ ohms.
2. Draw the connection of service wire between LT pole and irrigation pump set shed. **(CO2)**
3. State the purpose of earthing. **(CO3)**
4. List different tests to be conducted before energizing a newly constructed electrical installation. **(CO4)**
5. State any two I.E. Rules on industrial safety. **(CO4)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) A 10 H.P (metric), 415 V, 3-phase, 50 Hz squirrel-cage Induction motor is to be Installed in a floor mill, the plan of which is shown in Fig. 2.23. Show the layout of wiring diagram and estimate the quantity of materials required and their approximate cost. Assume any missing data. **(CO2)**

(or)

(b) Draw a neat sketch of a submersible irrigation pump set of 10 H.P, 3-phase, 400 V, 50Hz motor positioned at a depth of 38 m in a tube well from the ground level. The distance between the nearest L.T pole and switch control room is 10m and distance between switch control room and tube well is 3 m. Estimate the quantity of materials required and their cost. Also draw wiring diagram. **(CO2)**

7. (a) Estimate the quantity of material required for a 11kV, 3-phase overhead line with 6/1 × 2.59 mm ACSR conductor for 1km long on 8m PSCC poles. The span between two poles is 75 m. StateCoulomb'slawsofElectrostatics. **(CO3)**

(or)

(b)Draw a neat sketch of plate earthing and estimate the quantity of materials required. **(CO3)**

8. (a) Calculate the regulation of a distribution line with 7/2.11 mm ACSR conductor which is emanating from Distribution transformer, the load particulars with distance are shown in Fig. **(CO4)**

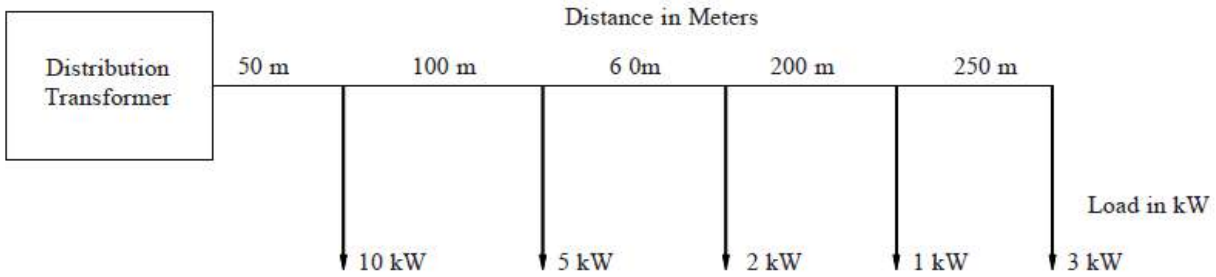

Fig : Load Particulars of a Distribution Line

(or)

(b) Determine the capacity of a transformer required in a village for the following load particulars.

1. 100 No's of domestic loads of 500W each.
2. 2 Industries with 5 H.P. motors each.
3. 50 Agricultural pump-sets with 2 H.P. motors each.
4. 1 Hospital with a load of 10 kW load. **(CO4)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-404
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-404 : ELECTRICAL INSTALLATION AND ESTIMATION

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. State the use of standard wire gauge. **(CO1)**
2. State the reasons for fire accidents in electrical system**.** **(CO1)**
3. Define service main and state different types of service mains. **(CO2)**
4. Draw the wiring layout for a workshop**.** **(CO2)**
5. Calculate the size of the cable for the given 3-phase, 7.5 HP, 400V induction motor. **(CO2)**
6. Estimate the quantity of schedule for number of poles, number of stays with 1 km, 11kV over head line as per IE rule. **(CO3)**
7. List any six materials used in plinth mounted sub-station. **(CO3)**
8. State the purpose of earthing. **(CO3)**
9. State the need for load survey in a rural electrification. **(CO4)**
10. State the IE rules for the safety of industry. **(CO4)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) Explain surface PVC conduit wiring with legible sketches. **(CO1)**

(OR)

(b) Explain the procedure of first aid for shock treatment to an electrocuted person.**(CO1)**

12. (a) Estimate the quantity of materials required and their cost to make the surface type conduit wiring for a building, the plan of which is shown in Fig. Assume any missing data. **(CO2)**

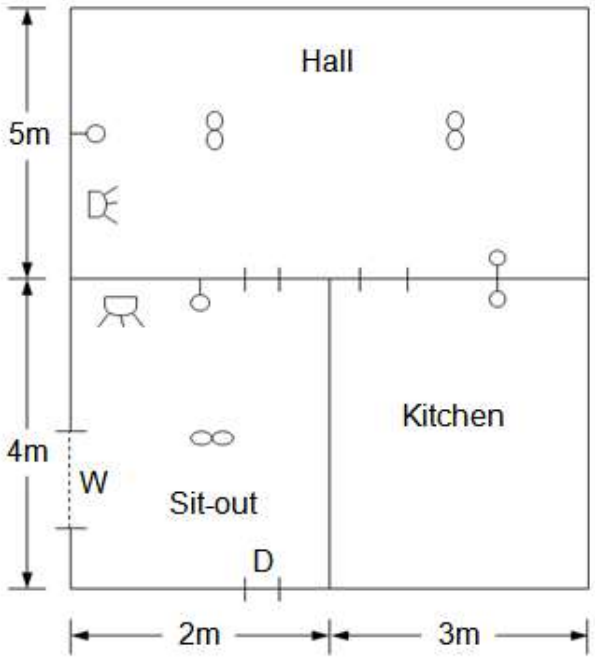

Fig. Plan of a building

(OR)

(b) The plan of a residential building is shown in Fig. It is to be provided with C.T.S. system of wiring. Estimate thematerials required and its cost. Wattage of Lamps = 60W, Fan = 80W, 5A socket = 100W, 15A socket = 1000W. Assume any missing date. **(CO2)**

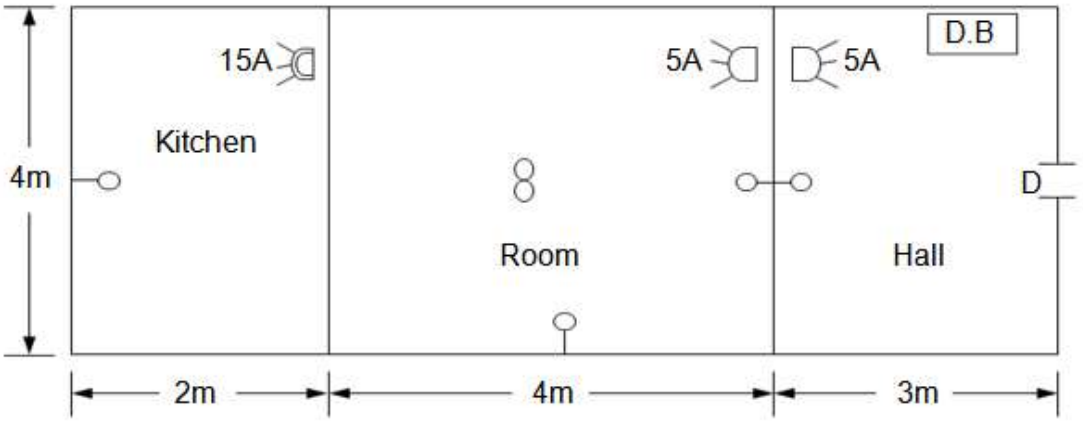

Fig. Plan of a residential building

13. (a) A 400V, 3-Ø, 2 no's induction motors are to be installed in a workshop as shown in Fig. Prepare a schedule with quantity of material and its approximate cost. Draw a wiring layout. Assume missing data, if any. **(CO2)**

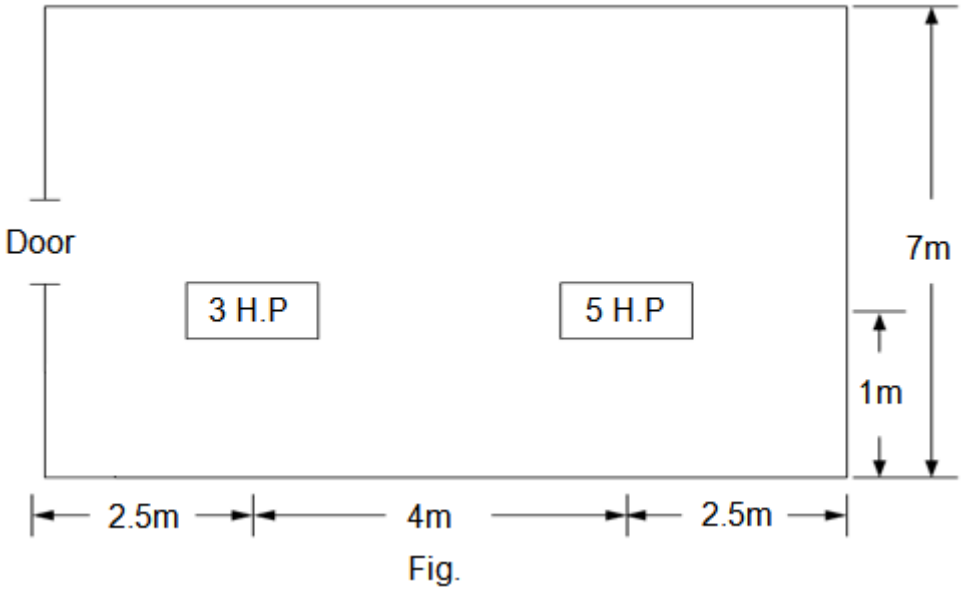

Fig.

(OR)

(b) Draw a neat sketch of a submersible irrigation pump set of 10 H.P, 3-phase, 400V, 50Hz motor positioned at a depth of 38m in a tube well from the ground level. The distance between the nearest L.T pose and switch control room is 10m and distance between switch control room and tube well is 3m. Estimate the quantity of materials required and their cost. Also draw wiring diagram. **(CO2)**

14. (a) Estimate the quantity of materials required for a 11KV overhead line for a length of 3.5 Km with an assumption of 60m span, with 7/2.59 sq.mm ACSR conductor and 2 cut points in the line. **(CO3)**

(OR)

(b) Draw a neat sketch of 11kV/440V pole mounted substation and estimate the quantity of materials required for the erection. **(CO3)**

15. (a) Describe the test procedure for continuity of wiring in an electrical installation with a legible sketch. **(CO4)**

(OR)

(b)Calculate the regulation of a distribution line with 7/2.59mm ASCR conductor with the following load particulars as shown in Fig. **(CO4)**

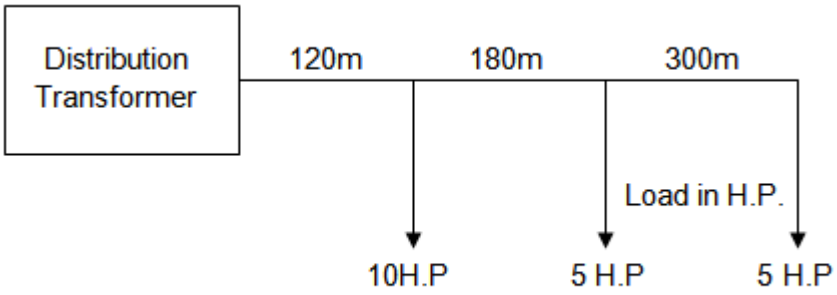

Fig. Load particulars of a Distribution line

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**

ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. A two bed room house consists of following load particulars. **(CO2)**

(i) Bed room – 1 : one light, one fan, one 5A socket

(ii) Bed room – 2 : one light, one fan

(iii) Kitchen : One light, one 15A socket

(iv) Sitout : One light, One Fan and one light socket

Design the wiring layout for the above loads with main switch and fuse unit. Also provide proper earthing for required points.

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ELECTRONICS ENGINEERING

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-405	ELECTRONICS ENGINEERING	4	60	20	80

COURSE OUTCOMES MAPPING

S.No	Unit Titles	No. of periods	CO's Mapped
1.	Semiconductor devices	12	CO1
2.	Power Supplies	8	CO2
3.	Amplifiers	20	CO3
4	Oscillators	8	CO4
5.	Linear Integrated Circuits	12	CO5
	Total	**60**	

COURSE OBJECTIVES	i). To introduce students to the basic theory of semiconductor devices and their practical applications in electronics.
	ii). To familiarize students to the principle of operation, design and synthesis of different electronic circuit and integrated circuits, and their applications.
	iii). To provide strong foundation for further study of electronic circuits and integrated circuits.

COURSE OUTCOMES	CO1	EE405.1	Analyze the formation and working of various semiconductor devices.
	CO2	EE405.2	Explain the rectifiers and voltage regulators.
	CO3	EE405.3	Analyze the need of baising, small signal amplifier, large signal amplifier and feed back amplifier.
	CO4	EE405.4	Analyze various oscillators.
	CO5	EE405.5	Analyse the op-amp application circuits.

LEARNING OUTCOMES

Semiconductor Devices

1.1 Define PN Junction Diode and explain the formation of it.
1.2 Explain the working of PN Junction diode with no bias, forward bias and reverse bias.
1.3 Draw the VI characteristics of PN Junction Diode.
1.4 Explain the working of Zener diode.
1.5 Draw the VI characteristics of Zener diode.
1.6 Explain formation of PNP and NPN transistors
1.7 State the different configurations of transistors.

1.8 Plot the Input / Output characteristics of a transistor in CB, CE and CC configurations.
1.9 Compare the performance characteristics of a transistor in CB, CE and CC configurations.
1.10 Explain the working and VI characteristics of
(a) FET (b) LED (c) LDR
(d) Photo Diode (e) Photo Transistor (f) Opto-coupler

Power Supplies

2.1 Define Rectifier.
2.2 Explain the working and, draw the circuit diagrams and waveform diagrams of:
(a) Half Wave Rectifier (b) Full Wave Rectifier (c) Bridge Rectifier
2.3 State the need of filter in power supplies.
2.4 List the different types of filters used in power supplies.
2.5 Explain the working of Zener diode as a Voltage regulator in a power supply.
2.6 Explain the working of voltage regulated power supply.

Amplifiers

3.1 Define Amplifier
3.2 Explain the operation of transistor as an amplifier.
3.3 State the necessity of proper biasing in transistor amplifier.
3.4 List different biasing methods.
3.5 Explain the potential divider bias.
3.5 Determine the operating point on the set of characteristics.
3.6 Classify amplifiers on the basis of
(a) Frequency (b) Function (c) Type of load
(d) Period of Conduction (e) Number of stages.
3.7 Define the terms (a) gain (b) band width
3.8 List the applications of amplifiers.
3.9 List the different types of coupling methods in amplifiers
3.10 Explain the working and, draw the circuit diagrams and frequency response curves of:
(a) RC coupled amplifier (b) Transformer coupled amplifier
3.11 Explain the need for power amplifier.
3.12 Distinguish between voltage amplifier and power amplifier.
3.13 Define the terms (a) feedback (b) feedback factor
3.14 Explain the effect of feedback on gain, band width and noise
3.15 Draw the block diagrams and explain the working of Voltage Series, Voltage Shunt, Current Series and Current Shunt feedback amplifiers.

Oscillators

4.1 Define Oscillator and classify different types of oscillators
4.2 State the conditions required for sustained oscillations
4.3 State the need of (a) AF Oscillator (b) RF Oscillator (c) Square Wave Oscillator
4.4 Draw the circuit diagram and explain the working of
(a) RC Phase Shift Oscillator (b) Hartley Oscillator (c) Colpitt's Oscillator
4.5 Explain the working of transistor based Astable Multivibrator circuit.
4.6 List the applications of oscillators.

Linear Integrated Circuits

5.1 Define Integrated Circuit.

5.2 List the advantages of Integrated Circuits over Discrete Circuits.

5.3 Explain the operation of Differential Amplifier.

5.4 List the characteristics of an Ideal Operational Amplifier.

5.5 Explain the working of Operational Amplifier.

5.6 Explain the working of OpAmp Inverting Amplifier.

5.7 State the concept of virtual ground.

5.8 Explain the Operational Amplifier as
(a) summer (b) integrator (c) differentiator (d) inverter.

5.9 Draw the Pin Diagram of 741 IC and state its important specifications and function of each pin.

5.10 Draw the Pin Diagram of 555 Timer IC and state its important specifications and function of each pin.

CO'S – PO'S – PSO'S MAPPING STRENGTH

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE405.1	3							3		
EE405.2	3		2					3		
EE405.3	3	1.5						3	1	
EE405.4	3	1.5	1					3		
EE405.5	3	1		1	1.5			3	1	
Average	**3**	**1.34**	**1.5**	**1**	**1.5**			**3**	**1**	

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Semi-conductor Devices

PN Junction Diode, forward and reverse bias- Zener diode, Zener diode characteristics - formation of PNP and NPN transistors- Transistor configurations - CB, CE and CC - Input and output characteristics of CB, CE and CC - Comparison of CB, CE and CC configurations - FET, LED, LDR, Opto-Coupler, Photo diode, Photo transistor - characteristics and their applications.

Power supplies

Half wave, Full wave and Bridge rectifiers, Types of Filters, Voltage regulated power supply using Zener Diode.

Amplifiers

Principles of Operation- Biasing and stabilization technique - Operating point and Load line Characteristics - Classification of Amplifiers, Coupling methods, Frequency Response of R.C coupled amplifier, transformer coupled amplifiers – applications - Power amplifier - feedback- Voltage Series and Voltage Shunt, current series and current shunt feedback amplifiers.

Oscillators

Oscillator - types of oscillators - AF Oscillator - RF Oscillator -Square wave Oscillator - RC phase shift Oscillator -Hartley oscillator- Colpitt's oscillator - applications of oscillators.

Linear Integrated circuits.

Differential Amplifier - advantages of ICs - Operational Amplifier – Gain – summer – integrator – differentiator - scale changer – inverter -741 IC - IC 555 timer.

Note : 1. This subject is to be taught by Electronics & Communication Engg. faculty

2.Paper setting and paper evaluation is also to be done by Electronics & Communication Engg Faculty.

REFERENCE BOOKS

1. V.K. Mehta,Rohitmehta-Principles of Electronics, S Chand & Co.
2. G.K. Mithal -Industrial Electronics-Khanna Publishers
3. G.K. Mithal -Applied Electronics-Khanna publishers
4. G.K.Mithal - Electronic devices and circuits-Khanna publishers
5. Albert Malvino,David J Bates-Electronic Principles-McGraw Hill
6. J.B.Gupta-A textbook of Electronics Engineering-KATSON BOOKS

BLUE PRINT

S. No	Unit Title	No. of periods	Weightage Allocated		Markswise Distribution of Weightage				Questionwise Distribution of Weightage				CO's Mapped
					R	U	Ap	An	R	U	Ap	An	
1	Semiconductor devices	12	14	*	3	3	8	*	1	1	1	*	CO 1
2	Power Supplies	8	14		3	3	8		1	1	1		CO 1, CO 2
3	Amplifiers	20	14	*	3	3	8	*	1	1	1	*	CO 3, CO 4
4	Oscillators	8	14	*	3	3	8	*	1	1	1	*	CO 3, CO 4
5	Linear Integrated Circuits	12	14	*	3	3	8	*	1	1	1	*	CO 4, CO 5
	Total	**60**	**70**	**10***	**15**	**15**	**40**	**10***	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model Papers: Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.8
Unit Test-II	From 3.9 to 5.10

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-405
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-405 : ELECTRONICS ENGINEERING

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) Symbol for Opto-Coupler _____ .

   (b) Expand FET _____ .

   (c) Application of Common Collector configuration of Transistor is _____ .

   (d) Knee Voltage of Silicon Diode _____ . **(CO1)**

2. Draw the VI characteristics of Zener Diode. **(CO1)**

3. Define Rectifier and draw the circuit diagram of Half Wave Rectifier. **(CO2)**

4. State the need of filter in power supplies. **(CO2)**

5. Define amplifier. **(CO3)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Explain the working of PN Junction diode with no bias, forward bias and reverse bias.**(CO1)**

(OR)

(b) Explain the working and VI characteristics of Photo Transistor. **(CO1)**

7. (a) Explain the working and, draw the circuit diagrams and waveform diagrams of Bridge Rectifier. **(CO2)**

(OR)

(b) Explain the working of Zener diode as a Voltage regulator in a power supply. **(CO2)**

8. (a) Explain the operation of transistor as an amplifier with circuit diagram. **(CO3)**

(OR)

(b) List the biasing methods of amplifier and explain the potential divider bias. **(CO3)**

***

MODEL PAPER – FORMATIVE ASSESMENT-2
C-20-EE-405
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-405 : ELECTRONICS ENGINEERING

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) Feedback factor isdefined as _____ .

   (b) In voltage amplifier the amplitude of input A.C signal is_____ .

   (c) _____ coupling is used in power amplifiers.

   (d) In power amplifier the collector load has _____ resistance. **(CO4)**

2. Define oscillator and classify it. **(CO4)**

3. List any three applications of oscillators. **(CO4)**

4. List any three advantages of Integrated Circuits over Discrete Circuits. **(CO5)**

5. State the concept of virtual ground. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Explain the effect of feedback on gain, band width and noise. **(CO3)**

   (OR)

   (b) Explainthe working of Voltage Series and Current Shunt feedback amplifiers. **(CO3)**

7. (a) Draw the circuit diagram and explain the working of Hartley Oscillator. **(CO4)**

   (OR)

   (b) Explain the working of transistor based Astable Multivibrator circuit. **(CO4)**

8. (a) Explain the working of OpAmp Inverting Amplifier with circuit diagram. **(CO5)**

   (OR)

   (b) Draw the Pin Diagram of 555 Timer IC and state its important specifications and function of each pin. **(CO5)**

***

MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-405
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-405 : ELECTRONICS ENGINEERING

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. Define PN Junction diode and draw its block diagram and symbol. **(CO1)**
2. Draw the VI characteristics of Zener Diode. **(CO1)**
3. Define Rectifier and draw the circuit diagram of Half Wave Rectifier. **(CO2)**
4. State the need of filter in power supplies. **(CO2)**
5. Define amplifier. **(CO3)**
6. List any three applications of amplifiers. **(CO3)**
7. Define oscillator and classify it. **(CO4)**
8. List any three applications of oscillators. **(CO4)**
9. List any three advantages of Integrated Circuits over Discrete Circuits. **(CO5)**
10. State the concept of virtual ground. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) Explain the working of PN Junction diode with no bias, forward bias and reverse bias.**(CO1)**

(OR)

(b) Explain the working and VI characteristics of Photo Transistor. **(CO1)**

12. (a) Explain the working and, draw the circuit diagrams and waveform diagrams of Bridge Rectifier. **(CO2)**

(OR)

(b) Explain the working of Zener diode as a Voltage regulator in a power supply. **(CO2)**

13. (a) Explain the operation of transistor as an amplifier with circuit diagram. **(CO3)**

(OR)

(b) List the biasing methods of amplifier and explain the potential divider bias. **(CO3)**

14. (a) Draw the circuit diagram and explain the working of Hartley Oscillator. **(CO4)**

(OR)

(b) Explain the working of transistor based Astable Multivibrator circuit. **(CO4)**

15. (a) Explain the working of OpAmp Inverting Amplifier with circuit diagram. **(CO5)**

(OR)

(b) Draw the Pin Diagram of 555 Timer IC and state its important specifications and function of each pin. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. This question carries ten marks.

ii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

16. What happens if the impedance matching is not done in an amplifier. Explain **(CO3)**

***

GENERAL MECHANICAL ENGINEERING

Course Title	Course Code	No. of periods/ week	Total periods	Marks for FA	Marks for SA
GENERAL MECHANICAL ENGINEERING	EE-406	4	60	20	80

TIME SCHEDULE

S. No.	Chapter /Unit Title	Periods	Weightage of Marks	Short Answer Questions (3M)	Essay Type Questions (8M)	Higher Order Question (10M)
1.	Simple Stresses and Strains	12	14	02	01	
2	Torsion in Shafts	10	14	02	01	
3	I.C. Engines	12	14	02	01	01
4	Boilers and Turbines	14	14	02	01	
5.	Hydraulic Pumps	12	14	02	01	
Total		**60**	**70+10**	**10**	**05**	**01**

Note: 10 Marks higher order question may be given from the Chapter - 3 or 4 or 5.

COURSE OBJECTIVES & COURSE OUTCOMES

Upon completion of the course the student shall be able to	
COURSE OBJECTIVES	Understand the concept of stress , strain and Torsional stress and know the working of I.C engines, Boilers , Turbines and Pumps.

COURSE OUTCOMES	**C01**	EE-406-1	Explain the concept of stress, strain and various Elastic constants with numerical problems.
	C02	EE-406-2	Explain the Torsional Stresses in circular shafts – Solve Simple problems on solid and hollow shafts.
	C03	EE-406-3	Analyze the Working of I C Engine Systems
	C04	EE-406-4	Analyze the Working of Boilers and Turbines
	C05	EE-406-5	Analyze the Working of Pumps

CO-PO MAPPING

POs	Mapped with CO No	No of COs: 05			No. of periods: 75
		CO Periods Addressing PO in Col 1		Level (1,2,3)	Remarks
		No	%		
PO1	CO1 - CO5	30	50	3	>40% Level 3 (Highly Addressed) 25% to 40% Level 2 (Moderately Addressed) 5% to 25% Level 1 (Low Addressed) <5% Not Addressed
PO2	CO1, CO2	10	16.66	1	
PO3	CO2	10	16.66	1	
PO4					
PO5					
PO6					
PO7	CO3 - CO5	10	16.67	1	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1						2	2	
CO2	3	1						2		
CO3	3		1				1		2	
CO4	3						1		2	
CO5	3						1		2	

3: High, 2: Moderate,1: Low

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quiz (vii) Industry Visits (viii) Tech Fest (ix) Mini Projects (x) Library Visits.

Blue Print of the Question Paper

S. No	Chapter Name	Periods Allocated	Weightage Allocated		Marks Wise Distribution of Weightage				Question Wise Distribution of Weightage			
					R	U	Ap	An	R	U	Ap	An
1.	Simple Stresses and Strains	12	14		03	03	08		01	01	01	
2	Torsion in Shafts	10	14		03	03	08		01	01	01	
3	I.C. Engines	12	14	*	03	03	08	*	01	01	01	*
4	Boilers and Turbines	14	24	*	03	03	08	*	01	01	01	*
5.	Hydraulic Pumps	12	14	*	03	03	08	*	01	01	01	*
Total		**60**	70	**10***	**15**	**15**	**40**	**10***	**05**	**05**	**05**	**01**

R-Remembering; U-Understanding; Ap-Applying; An- Analylising

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Learning Objectives:

1.0 Simple Stresses and Strains

1.1. Define the terms of Tensile stress, Compressive stress, Shear stress, Linear strain, lateral strain, Poisson's ratio and elastic limit - Identify the different types of stresses and Strains. State Hooke's law
1.2. Draw stress-strain curves for ductile and brittle materials under tension.
1.3. Define a) Working stress, ultimate stress, yield stress and factor of safety
b) Young's modulus, Modulus of rigidity, Bulk modulus
1.4. State the factors to be considered in selecting factor of safety.
1.5. State the relationship between the three modulii of elasticity –Simple Problems
1.6. Olve a) Simple problems on the three modulii of elasticity
b) Simple problems on uniform bars subjected to loads
c) Simple problems on stepped bars subjected to loads

2.0 Torsion in Shafts

2.1. State the function of shafts
2.2. Classify shafts
2.3. Specify the standard sizes and materials of shafts
2.4. Derive the torsion equation with usual notations
2.5. State the procedural steps in design of solid shaft and hollow shaft.
2.6. Design a shaft (both solid and hollow) on the basis of strength and rigidity – simple problems.

3.0 I.C.ENGINES

3.1 Classify I.C. Engines
3.2 Functions of main components of an I.C. Engine.
3.3 Illustrate the working of four stroke petrol engine
3.4 Illustrate the working of four stroke diesel engine
3.5 Illustrate the working of two stroke petrol engine
3.6 Compare four stroke and two stroke engines
3.7 Compare petrol engine and diesel engine
3.8 Ignition Systems of Petrol Engines.

4.0 Boilers and Turbines

4.1. Classify steam boilers
4.2. Compare fire tube and water tube boilers
4.3. Explain various a) Popular boiler mountingsb) Popular boiler accessories
4.4 Differentiate boiler mountings and accessories
4.5. Illustrate the working of Lamont boiler.
4.6. Classify steam turbines
4.7. Illustrate(i) Working of De-laval steam turbine (ii) Working of Parson's reaction turbine-
4.8. Compare impulse and reaction turbines
4.9. Classify hydraulic turbines.
4.10 Illustrate the working of Pelton wheel.
4.11 Illustrate the working of Francis turbine.
4.12 Illustrate the working of Kaplan turbine.

5.0 Pumps

5.1. Classify hydraulic pumps
5.2. Compare centrifugal and reciprocating pumps
5.3. Illustrate
(i) The working of single acting and double acting reciprocating pumps
(ii) The working of a single stage centrifugal pump
(iii) The working of a jet pump
(iv)The working of a submersible pump

COURSE CONTENT

1.0 Simple stress and strains

Definitions of Tensile stress, Compressive stress, Shear stress, Linear strain, lateral strain and, Poisson'sratio, elastic limit, Hook's law - stress-strain diagram for ductile and brittle materials under tension - Working stress, Ultimatestress, yield stress - Factor of safety – selection of factor of safety-Young's modulus, Modulus of rigidity, Bulk modulus, relationship between the three elastic constants (without proof) . Simple problems on bars of uniform section subjected to external loading,Simple problems on bars of stepped section subjected to external loading.

2.0 Torsion in shafts

Function of shafts – classification of shafts - standard shaft sizes
Derive Torsion equation – simple problems-
Design of solid shaft and hollow shaft based on strength and rigidity – Simple problems.

3.0 I.C. Engines.

Classification of I.C Engines – Functions of main components of I.C engine - Description of four stroke petrol engine,four stroke diesel engine and two stroke petrol engine- Comparison between petrol and diesel engines-Comparison between two stoke and four stroke engines.
Ignition Systems of Petrol Engines : Working of Coil Ignition system and Magneto Ignition system.

4.0 Boilers and Turbines

Classification of boilers – Differences between fire tube and water tube boilers – Functions of popular mountings and accessories - Difference between Mountings and Accessories –Sketch and explain the working of Lamont high pressure boiler.

Working principle of Steam turbine - Classification of steam turbines - Comparison between impulse and reaction turbines - Description of a De-Laval impulse turbine - Description of Parson's reaction turbine.

Classification of hydraulic turbines - Description of Pelton wheel - Description of Francis turbine, Description of Kaplan turbine

5.0 Hydraulic Pumps

Classification of pumps - Comparison between Centrifugal and Reciprocating pumps –
Description of Single acting and double acting reciprocating pumps.
Description of single stage centrifugal pump
Description of a jet pump
Description of a submersible pump

Note : 1. This subject is to be taught by Mechanical faculty
2. Paper setting and paper evaluation is also to be done by Mechanical Faculty.

REFERENCES

1 Ramamrutham - Strength of materials-Dhanpat Rai publishing company
2. Surender Singh- Strength of materials-Vikas publishing
3. S.B.Junarker- Strength of materials
4. R.K.Rajput - Strength of Materials-S.Chand&co
5. R.S. Kurmi - Strength of Materials-S.Chand&co
6. P.K.Nag,K.Tripathi,C B Pawar-Basic Mechanical Engineering-McGraw Hill companies
7. Pravin Kumar-Basic Mechanical Engineering-Pearson

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II
EE-406 :: GENERAL MECHANICAL ENGINEERING

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 3.7
Unit Test – II	From 3.8 to 5.3

Unit Test - 1

Q.No	Question from the Chapter	Bloom's category	Marks allocated	CO addressed
Part - A (16 marks)				
1	Simple stresses & strains Torsion in shafts I.C Engines	R	4	CO1 – CO3
2, 3	Simple stresses & strains	U/R	6	CO1
4	Torsion in shafts	U	3	CO2
5	I.C Engines		3	CO3
Part - B (24 marks)				
6	Simple stresses & strains	U/Ap	8	CO1
7	Torsion in shafts	U/Ap	8	CO2
8	I.C Engines	U/Ap	8	CO3

Unit Test - 2

Q.No	Question from the Chapter	Bloom's category	Marks allocated	CO addressed
Part - A (16 marks)				
1	I.C engines ignition systems, Boilers and Turbines Pumps	R	4	CO3 – CO5
2	Boilers	U/R	3	CO4
3	Turbines	U/R	3	CO4
4, 5	Pumps	U/R	6	CO5
Part - B (24 marks)				
6	Boilers and Turbines	U/Ap	8	CO4
7	Pumps	U/Ap	8	CO5
8	I.C engines ignition systems	U/Ap	8	CO3

R-Remembering; U-Understanding; Ap-Applying; An- Analylising

FORMATIVE ASSESSMENT -1
BOARD DIPLOMA EXAMINATION,
UNIT TEST - 1
EE-406 :: GENERAL MECHANICAL ENGINEERING

Time : 90 Minutes Total Marks: **40**

PART – A

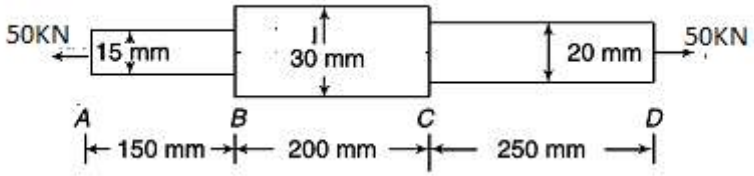
Instructions: ***1st Question having 4 one mark questions, and remaining 4 Questions carry 3 marks each***

1. (a) State Hooke's Law(b) Define Poisson's Ratio(c) Write the torsion equation
(d) State function of spark plug
2. Define (a) Stress (b) Strain
3. A bar of 25 mm diameter is tested in tension. It is observed that when a load of 60 kN is applied, the extension measured over a gauge length of 200 mm is 0.12 mm . Find the values of stress and strain.
4. A shaft running at 360 rpm is producing a torque of 15 kN-m. Find the power transmitted by the shaft.
5. Write two differences between S.I and C.I engines.

PART – B

Instructions: ***Part B consists of 3 Units. Answer any one full question from each unit. Each question carries 8 marks and may have sub questions.***

6. A steel circular bar has three segments as shown in the fig. Determine the total elongation of the bar. Take E = 210 GPa.



(OR)

Draw the stress-strain diagram for a typical ductile material and locate the salient points on it

7 a) Find the diameter of solid shaft required to transmit 550 kW power at 250 RPM. The maximum allowable shear stress is not exceeded 60 N/mm^2 and twist is not exceeded 2^0 in a length of 2m. Take Modulus of rigidity $G=0.8X105N/mm^2$.

(OR)

b) Write the procedural steps involved in design of a shaft

8. a) Write in brief about the following terms related to IC engines:
(i) Stroke (ii) Clearance volume(iii) Compression ratio (iv) Cylinder liner

(OR)

b) Describe the working of four stroke petrol engine with a neat sketch.

***

C20-EE-406

BOARD DIPLOMA EXAMINATION,
FORMATIVE ASSESSMENT- 2
GENERAL MECHANICAL ENGINEERING

Time : 90 Minutes Total Marks: **40**

PART – A

Instructions: ***1st Question having 4 one mark questions, and remaining 4 Questions carry 3 marks each***

1. (a) Priming is done in reciprocating pump (True / False)

   (b) Pelton wheel is a _____ turbine

   (c) Feasible plug is a boiler (Mountting / Accessory)

   (d) List two ignition systems of petrol engines.

2. Write two differences between fire tube and water tube boilers.
3. Write differences between impulse and reaction turbine.
4. Write differences between centrifugal pumps and reciprocating pumps
5. Write differences between single acting and double acting reciprocating pumps.

PART – B

Instructions: ***Part B consists of 3 Units. Answer any one full question from each unit. Each question carries 8 marks and may have sub questions.***

6. Describe the working of Lamont high pressure boiler with a neat sketch.

   (OR)

   Explain the different boiler mountings.

7. Explain the working of Coil Ignition system with a neat sketch

   (OR)

   Explain the working of Magneto ignition system with a neat sketch

8. Describe the working of Jet pump with a neat sketch

   (OR)

   Describe the working of submersible pump with a neat sketch

***

C20-EE-406

SUMMATIVE ASSESMENT
BOARD DIPLOMA EXAMINATION, (C-20)
MODEL QUESTION PAPER
DEEE - FOURTH SEMESTER EXAMINATION
GENERAL MECHANICAL ENGINEERING

Time: 3 hours] [Total Marks : 80

PART-A **3 X 10=30**

Instructions: (i) Answer **all** questions.
(ii) Each question carries **three** marks.
(iii) Answer should be brief and straight to the point and shall not exceed five simple sentences.

1. State Hooke's law
2. Draw stress-strain curves for ductile materials under tension
3. State the functions of shaft
4. List various materials used in the manufacturing of shafts
5. List out the various components of an I.C.Engines.
6. Write different methods of ignition in petrol engine .
7. State the working principle of a steam turbine.
8. List various Boiler Mountings and Accessories
9. List out different types of hydraulic turbines.
10. Distinguish between centrifugal and reciprocating pumps

PART-B **8 X 5=40**

Instructions: (i) Answer **all five** questions.
(ii) Each question carries **eight** marks.
(iii) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. a) A mild steel bar has a diameter of 25 mm and is 350 mm long. A tensile load of 75 kN is applied longitudinally. Calculate the elongation of the bar, the change in diameter. Take E = 2 x 10^5 GPa and Poisson's ratio is 0·3.

(OR)

b) A cylindrical bar is of 25 mm diameter and 1·25 m long. The linear strain is 4 times the lateral strain. Calculate the shear modulus and bulk modulus if the bar is elongated by 0·06 mm under an axial load of 50 kN

12. a) Find the diameter of solid shaft required to transmit 750 kW power at 250 RPM. The maximum allowable shear stress is not exceeded 50 N/mm^2 and twist is not exceeded 2^0 in a length of 2m. Take Modulus of rigidity $G=0.8X10^5 N/mm^2$.

(OR)

b) Derive torque equation with usual notations.

13. (a) Explain with a line sketch the working of 4- stroke Diesel engine

(OR)

(b) Explain with a line sketch the working of 2- stroke petrol engine

14. a) Describe the Lamont Boiler with the help of a neat sketch.

(OR)

b) Distinguish between impulse and reaction turbines

15. a) Describe the working of a single stage-centrifugal pump with a neat sketch

(OR)

b) Explain the working principle of Pelton wheel with a neat sketch

PART-C **1 X 10=10**

Instruction:Answer the following ONE question which carries TEN marks.

16. Analyse the merits and demerits of Francis turbine with Kaplan turbine.

***

ELECTRICAL ENGINEERING DRAWING - II

Course code	Course title	No.of periods / week	Total no. of periods	Marks for FA	Marks for SA
EE-407	Electrical Engineering Drawing - II	6	90	40	60

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Switch gear, Protection and Cables.	14	CO1
2	Transformers	24	CO2
3	Substations and Power Plants	12	CO3
4	Induction Motors	25	CO4
5	AC Windings	15	CO5
TOTAL		**90**	

Course Objectives	iTo understand and draw the different sectional views of transformerand inductionmotor. Ii. To comprehend and draw different circuit breakers, Lightning arrestors andcables. Iii. To familiarise with A.C.windings, sketches of substations and powerplants.

Course outcomes	**CO1**	EE-407.1	Draw different circuit breakers, Lightning arrestors, cables and various Insulators.
	CO2	EE-407.2	Draw the views of single and three phase core type transformers.
	CO3	EE-407.3	Draw the line diagrams of substations and various power plants.
	CO4	EE-407.4	Draw various views of Induction Motors and Starters.
	CO5	EE-407.5	Design and draw different A.C. windings.

LEARNING OUTCOMES

Switch gear, Protection andCables.

1.1 Sketch and label the parts of thefollowing Circuit breakers
(i) Minimum oil circuit breaker (ii) Bulk oil circuit breaker (iii) Air blast circuit breaker and (iv) SF_6 Circuitbreaker.

1.2 Sketch the following lightning arrestors and name theparts.

(i) Valvetype (ii) Thyritetype.

1.3 Draw the cross sectional views of cables and label itsparts

(i) Singlecore (ii) 3-core belted cable (iii) 4-corecables

(iv) H-typecable (v) SL type cable (vi) HSL typecable

1.4 Draw and label the parts of the following insulators.

(i) Pin type (ii) Suspension type (iii) shackle type

Transformers

2.1 Draw different views of core sections of aTransformer.

2.2 Draw sectional elevation and plan of a single-phase core type transformer from the given data.

2.3 Draw sectional elevation and plan of a 3 phase core type transformer from the givendata.

Substations and PowerPlants

3.1 Draw the sketchof

(i) 11kV / 400 volts Pole mountedsubstation

(ii) 11kV / 400 volts Plinth mountedsubstation

3.2 Draw the schematic diagram of 33kV / 11kVsubstation and label the parts.

3.3 Draw the schematic diagram of 220kV / 132kVsubstation and label the parts.

3.4 Draw the single line diagram for Thermal power plant and name theparts.

3.5 Draw the schematic diagram for Medium head hydro- electricplant and name theparts.

3.6 Draw the schematic diagram for High head hydroelectric powerplant and name theparts.

3.7 Draw the line diagram for Moderated type Nuclear powerplant and name theparts.

InductionMotors

4.1 Draw the assembled views of inductionmotors.

4.2 Draw the dimensioned views of different parts of an induction motor (stator, rotor, shaft end shields and sliprings).

4.3 Draw the Half – sectional elevation and end views of an assembled 3 phase squirrel cage induction motor from the givendata

4.4 Draw the Half – sectional elevation and end views of an assembled 3 phase slip ring induction motor from the givendata.

4.5 Draw the wiring diagram of D.O.L.Starter

4.6 Draw the wiring diagram of Autotransformerstarter

4.7 Draw the wiring diagram of Rotor resistancestarter

4.8 Draw the wiring diagram of manually operated Star/deltastarter.

A.C.Windings.

5.1 Draw the developed winding diagram of a 1-phase, single layer lap winding with winding table.

5.2 Draw the developed winding diagram of a 1-phase, single layer wave winding with winding table.

5.3 Draw the developed winding diagram of a 3-phase, single layer lap winding with winding table.

5.4 Draw the developed winding diagram of a 3-phase, single layer wave winding with winding table.

5.5 Draw the developed winding diagram of a 1-phase, single layer concentric winding with winding table.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-407.1	3	1.5	1					3	1	
EE-407.2	3	2	1					3	1	
EE-407.3	3							3		
EE-407.4	3		2	1				3	2	
EE-407.5	3							3		
Average	**3**	**1.75**	**1.3**	**1**				**3**	**1.3**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

1. **Switch gear, Protection andCables.**
   Different typesofC.B's-Valve type &Thyrite typelightning arresters -single core, 3 core belted cable, 4 core Cables, H - type cable , SL type cable and HSL typecable-pin type, Suspension type and Shackle type Insulators.
2. **Transformers**
   Core sections, sectional views of single-phase single stepped core type, three phase three stepped core type transformers.
3. **Substations and PowerPlants**
   Sketches of substations, pole mounted and plinth mounted substations- Schematic diagrams of 33/11KV, 220/132 KV substations – Diagrams of generating stations.
4. **InductionMotors**
   Sectional elevation and end views of 3 – phase Squirrel Cage Induction Motor , 3-Phase Slip Ring Induction motor – Different types of starters used for 3 – phase Induction Motor.
5. **A.C.Windings.**
   Single Layer Lap and Wave Windings and concentric windings - Winding tables of A.C. 1- phase and 3-phase single layer lap and wave windings.

REFERENCE BOOKS:

1. Simpson -Electrical EngineeringDrawing
2.C.R.Dargon.-Electrical Engineering Drawing-Asian
3.K.L.Narang.-Electrical EngineeringDrawing-Satya prakashan,New Delhi publisher
4. Surjit singh-Electrical EngineeringDrawing-II-KATSON BOOKS.
5. Dr. S.K. Bhattacharya - Electrical Engineering Drawing-New AGE International(P) Ltd. Publishers

Blue print:

S.No.	Unit title	No. of periods	Weightage allocated	Marks wise distribution of weightage			Question wise distribution of weightage			CO'S mapped
				R	U	Ap	R	U	Ap	
1.	Switch gear, Protection and Cables.	14	10	10	0	0	2	0	0	CO1
2.	Transformers	24	25	0	0	20	0	0	1	CO2
3.	Substations and Power Plants	12		5	0		1	0		CO3
4.	Induction Motors	25	25	5	0	20	1	0	1	CO4
5.	AC Windings	15		0	0		0	0		CO5
Total		**90**	**60**	**20**	**0**	**40**	**4**	**0**	**2**	

Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.3
Unit Test-II	From 3.4 to 5.4

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-407
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-407 : ELECTRICAL ENGINEERING DRAWING - II

Time: 120 Minutes Total Marks: 40 Marks

PART-A **4 x 5 = 20**

Instructions:

i. **Answer all questions.**
ii. **Each question carries five marks.**

1. Draw the SF_6 circuit breaker and label the parts. **CO1**
2. Draw the cross-section view of H-type cable and label the parts. **CO1**
3. Draw the Plan and elevation of Cruciform Core of transformer with core diameter of 10Cm and height of 7cm. **CO2**
4. Draw the single line diagram of 33/11kV substation and label the parts. **CO3**

PART-B **1 X 20 = 20**

Instructions:

i. **Answer the following question.**
ii. **This question carries Twenty marks.**

5. (a) Draw the full sectional elevation and sectional plan of a 10 kVA, 3300/440 V, three-phase core type power transformer with the following dimensions : **CO2**

Core type	=	3 stepped
Diameter of the circum circle	=	80
Centre to centre distance between cores	=	180
Yoke height	=	80
Total height of the transformer	=	520
Inside diameter of LT coil	=	90
Outside diameter of LT coil	=	110
Height of LT winding	=	240
Number of turns per limb	=	60
Inside diameter of HT coil	=	145
Outside diameter of LT coil	=	175
Height of HT winding	=	240
Number of turns per limb	=	250

All dimensions are in mm. Assume any missing data. (10 marks)

(or)

(b) Draw the sectional end view and elevation of single-phase, single-stepped, core-type transformer with the following dimensions : (20 marks) **CO2**

Core circle diameter	:	65 mm
Spacing between core centres	:	185 mm
LT winding inner diameter	:	70 mm
LT winding outer diameter	:	120 mm

HT winding inner diameter	:	125 mm
HT winding outer diameter	:	170 mm
Height of core	:	360 mm
Height of Yoke	:	60 mm
Height of Bakelite ring	:	20 mm

Assume any missing data in proportionate with above dimensions.

***

MODEL PAPER – FORMATIVE ASSESMENT-2
C-20-EE-407
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-407 : ELECTRICAL ENGINEERING DRAWING - II

Time: 120 Minutes Total Marks: 40 Marks

PART-A **4 x 5 = 20**

Instructions:

i. Answer all questions.

ii. Each question carries five marks.

1. Draw the Schematic diagram of Medium Head Hydro-Electric Power plant. **CO3**
2. Draw the wiring diagram of D.O.L Starter and label the parts. **CO4**
3. Draw the Schematic diagram of Nuclear Power plant. **CO3**
4. Draw the wiring diagram of Rotor Resistance Starter and label the parts . **CO4**

PART-B **1 X 20 = 20**

Instructions:

i. Answer the following question.

ii.This question carries Twenty marks.

5. (a) Draw the half-sectional end view and Elevation of 5 h.p., 400/440 V, 50 Hz, 1440 r.p.m., 3-phase squirrel cage induction motor. **CO4**

The main dimensions have been given below : 10
Outside diameter of the stator stampings = 230
Inside diameter of the stator stampings = 164
Thickness of the stator frame = 25
Slots :

- Types = open type
- Number = 36
- Size = 15 × 8

Air gap = 2

Outer diameter of the rotor stamping = 160
Inside diameter of the rotor stamping = 35
Shaft diameter :

- At centre = 35
- At bearing = 30

The rotor has totally closed type slots and contains bare conductors which are short circuited at both sides.
Other missing data may be assumed (All dimensions are in mm). (20 marks)

(OR)

(b) Develop a Three-phase single-layer wave winding for a 4-pole AC machine having 24 slots.

(20 marks) **CO5**

***

MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-407
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FOURTH SEMESTER EXAMINATION
EE-407 : ELECTRICAL ENGINEERING DRAWING - II

Time: 3 hours Total Marks: 60

PART-A **4 x 5 = 20**

Instructions:

i. **Answer all questions.**
ii. **Each question carries five marks.**

1. Draw the SF6 circuit breaker and label the parts. **CO1**
2. Draw the cross-section view of H-type cable and label the parts. **CO1**
3. Draw the schematic diagram for medium head hydroelectric power plant and label the parts. **CO3**
4. Draw a neat sketch of rotor resistance starter used for 3-phase slip-ring induction motor and label the parts. **CO4**

PART-B **2 x 20 = 40**

Instructions:

i. **Answer all questions.**
ii. **Each question carries twenty marks.**

5. (a) Draw the full sectional elevation and sectional plan of a 10 kVA, 3300/440 V, three-phase core type power transformer with the following dimensions : **CO2**

Core type	=	3 stepped
Diameter of the circum circle	=	80
Center to center distance between cores	=	180
Yoke height	=	80
Total height of the transformer	=	520
Inside diameter of LT coil	=	90
Outside diameter of LT coil	=	110
Height of LT winding	=	240
Number of turns per limb	=	60
Inside diameter of HT coil	=	145
Outside diameter of LT coil	=	175
Height of HT winding	=	240
Number of turns per limb	=	250

All dimensions are in mm. Assume any missing data. (20 marks)

(OR)

(b) Draw the sectional Plan and Elevation of single-phase, single-stepped, core-type transformer with the following dimensions : (20 marks)**CO2**

Core circle diameter : 65 mm

Spacing between core centres	:	185 mm
LT winding inner diameter	:	70 mm
LT winding outer diameter	:	120 mm
HT winding inner diameter	:	125 mm
HT winding outer diameter	:	170 mm
Height of core	:	360 mm

Height of Yoke : 60 mm
Height of Bakelite ring : 20 mm
Assume any missing data in proportionate with above dimensions.

6. a) Draw the half-sectional end view and elevation of 5 h.p., 400/440 V, 50 Hz, 1440 r.p.m., 3-phase squirrel cage induction motor. **CO4**

The main dimensions have been given below : 10
Outside diameter of the stator stampings = 230
Inside diameter of the stator stampings = 164
Thickness of the stator frame = 25

Slots :

- Types = open type
- Number = 36
- Size = 15 × 8

Air gap = 2
Outer diameter of the rotor stamping = 160
Inside diameter of the rotor stamping = 35

Shaft diameter :

- At centre = 35
- At bearing = 30

The rotor has totally closed type slots and contains bare conductors which are short circuited at both sides.
Other missing data may be assumed (All dimensions are in mm). (20 marks)

(OR)

(b) Develop a Three-phase single-layer Lap winding for a 4-pole AC machine having 24 slots.

(20 marks) **CO5**

***

Communication Skills

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
EE-408	Communication Skills	3	45	40	60

S. No.	Unit Title	No of Periods	COs Mapped
1	**Listening Skills**	6	CO1
2	**Introducing Oneself**	3	CO1, CO2, CO3
3	**Short Presentation (JAM)**	6	CO1, CO2, CO3
4	**Group Discussion**	6	CO1, CO2, CO3
5	**Preparing Resume with Cover Letter**	3	CO3
6	**Interview Skills**	9	CO1, CO2, CO3
7	**Presentation Skills**	9	CO1, CO2
8	**Work place Etiquette**	3	CO1, CO2
Total Periods		**45**	

Course Objectives	To comprehend the features of communication needed for professional success and display the use of these competently
	To present ideas, opinions in group discussions and presentations on topics of general and technical interest
	To prepare for job selection processes

Course Outcomes		
Course Outcomes	CO1	Interacts in academic and social situations by comprehending what is listened to when others speak.
	CO2	Demonstrates effective English communication skills while presenting ideas, opinions in group discussions and presentations on topics of general and technical interest.
	CO3	Exhibits workplace etiquette relevant in classroom situations for easy adaptation in professional setting in the future.

CO-PO Matrix

Course Code EE-408	**Course Title: English Number of Course Outcomes: 3**				**No. of Periods: 45**
POs	Mapped with CO No.	CO Periods Addressing PO in Column 1		Level of Mapping (1,2,3)	Remarks
		Number	Percentage %		
PO1		Not directly applicable for Communication Skills Course however interactive activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.			
PO2					
PO3					
PO4					
PO5	CO1, CO2, CO3	11	25%		>60%: Level 3
PO6	CO1, CO2, CO3	27	60%		16 -59%: Level 2
PO7	CO1, CO2, CO3	7	15%		Up to 15%: Level 1

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

Mapping Course Outcomes with Program Outcomes:

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO 1					✓	✓	✓
CO 2					✓	✓	✓
CO3					✓	✓	✓

Blue Print for evaluation based on Course Outcomes for SA:
Note: Every Question based on CO has to be given marks for the following parameters of communication in the rubric.

- Fluency and Coherence
- Lexical Resource (Vocabulary)
- Grammatical Range and Accuracy

***Rubric Descriptors 'Good/ Competent / Fair /Poor' for Communication**

LEVEL OF COMPETENCE	**Fluency and Coherence**	**Lexical Resource (Vocabulary)**	**Grammatical Range and Accuracy**
GOOD (9-10*)	Speaks at length without noticeable effort or loss of coherence. May demonstrate language-related hesitation at times, or some repetition and/or self-correction.	Uses vocabulary resources flexibly during discussion. Uses paraphrase effectively.	Uses a range of complex structures with some flexibility.

	Uses a range of connectives and discourse markers with some flexibility. **Articulates and adapts to near naturalization.**	Uses some less common vocabulary and shows some awareness of style and collocation	Mostly produces error-free sentences.
COMPETENT (6-8)	Is willing to speak at length, though may lose coherence at times due to occasional repetition, self-correction or hesitation.	Has enough vocabulary to discuss topics and make meaning clear in spite of inappropriacies.	Uses a mix of simple and complex structures, but with limited flexibility.
	Uses a range of connectives and discourse markers but not always appropriately.	Generally paraphrases successfully	May make mistakes with complex structures though these rarely cause comprehension problems.
FAIR (3-5)	Tries to maintain a flow of speech but t uses repetition, self correction and/or slow speech to keep going.	Manages to talk about familiar and unfamiliar topics but uses vocabulary with limited flexibility.	Produces only basic sentence forms, however, errors persist.
	Produces simple speech fluently, but more complex communication causes fluency problems.	Attempts to use paraphrase but with mixed success.	Uses a limited range of more complex structures, but these usually contain errors and may cause some comprehension problems
POOR (0 *-2)	Speaks with long pauses. Pauses lengthy before most words. **Merely imitates**	Uses simple vocabulary to convey personal information	Attempts basic sentence forms but with limited success, or relies on apparently memorized utterances
	Has limited ability to link simple sentences	Has insufficient vocabulary for less familiar topics	Makes numerous errors except in memorized expressions
	Gives only simple responses and is frequently unable to convey basic message	Only produces isolated words or memorized utterances	Struggles to produce basic sentence forms

s*10 marks to be awarded only if competence level shows flawless expertise in English.
***0 marks to be awarded when student shows incoherence and gives irrelevant responses.**

Blue Print for evaluation based on Course Outcomes for SA of each student:
Note: Marks are awarded for each student as per the Rubric descriptors.

S. No.	Questions based on Course Outcomes	Periods Allocated for practical work	Marks Wise Distribution of Weightage	Marks allotment for each Student in the Rubric*				Mapping of COs
				Poor 0-2	Fair 3-5	Competent 6-8	Good 9-10	
1	Describe the given object in a minute	6	10					CO 2
2	Exchange ideas/ views in a group discussion on _____ issue (academic, technical or social)	6	10					CO1, CO 2
3	Present your ideas /opinions on the given issue/ topic (individual to an audience)	9	10					CO1, CO2, CO 3
4	Role play an imaginary work-place situation	6	10					CO1, CO2, CO 3
5	Individual interaction with the Examiner duly submitting Resume (Facing the Interview) – Introducing oneself and answering questions	12	10					CO1, CO2, CO 3
6	*Listen to and comprehend any audio communication/ content	6	10					CO1, CO2, CO 3
TOTAL		**45**	**60**					

***Listen to and comprehend the given audio content**: Giving the Students time to read the questions (Fill in the Blanks, Select from Alternatives, True or False, Table fill, etc.) in chunks before listening to audio inputs also played in chunks.

Blue Print for evaluation based on Course Outcomes for Formative Assessment:
Note: Every Question based on CO has to be given marks for the following parameters in the rubric.

- Fluency and Coherence
- Lexical Resource
- Grammatical Range and Accuracy

S. No.	Questions based on Course Outcomes	Periods Allocated for practical work	Marks Wise Distribution of Weightage	Marks allotment for each Student in the Rubric*				Mapping of COs
				Poor 0-2	Fair 3-5	Competent 6-8	Good 9-10	
Formative Assessment - 1								
1	Describe the given object in a minute	3	10					CO 2
2	Exchange ideas/ views in a group discussion on _____ issue (academic, technical or social)	6	10					CO1, CO 2
3	Present your ideas /opinions on the given issue/ topic (individual to an audience)	6	10					CO1, CO2, CO 3
4	*Listen to and comprehend any audio communication/ content	3	10					CO1, CO2, CO 3
Total		**18**	**40**					
Formative Assessment -2								
1	Present your ideas /opinions on the given issue/ topic (individual to an audience)	3	10					
2	Role play an imaginary work-place situation	6	10					CO1, CO2, CO 3
3	Individual interaction with the Examiner duly submitting Resume (Facing the Interview) – Introducing oneself and answering questions	15	10					CO1, CO2, CO 3

4	*Listen to and comprehend any audio communication/ content	3	10					CO1, CO2, CO 3
TOTAL		**27**	**40**					

Learning Outcomes

1. **Listening Skills:**
   - 1.1 Listen to audio content (dialogues, interactions, speeches, short presentations) and answer questions based on them
   - 1.2 Infer meanings of words / phrases / sentences / after listening to audio content as mentioned above
2. **Introducing Oneself:**
   - 2.1 Prepare a grid different aspects for presentation about a person / oneself
   - 2.2 Present a 1 or 2 minute introduction of oneself for an audience
3. **Short Presentation:**
   - 3.1 Define an object
   - 3.2 Describe an object, phenomenon, event, people
   - 3.3 Speak on a topic randomly chosen
4. **Group Discussion:**
   - 4.1 Practice Group Discussion. Techniques
   - 4.2 Participate in group discussions
5. **Resume Writing and Cover Letter:**
   - 5.1 Prepare resumes of different sorts – one's own and others.
   - 5.2 Write an effective cover letter that goes with a resume
6. **Interview Skills:**
   - 6.1 Prepare a good Curriculum Vitae
   - 6.2 Exhibit acceptable (Greeting, Thanking, Answering questions with confidence)
7. **Presentation Skills:**
   - 7.1 Prepare Posters, Charts, PPT's on issue of general and technical interest
   - 7.2 Present one's ideas before an audience with confidence using audio visual aids and answer questions that are raised.
8. **Workplace Etiquette:**
   - 8.1 Show positive attitude & adaptability / appropriate body language to suit the work place
   - 8.2 Display basic of etiquette like politeness, good manners.

Electrical machines-II Laboratory

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
EE-409(A)	Electrical machines-II Laboratory	3	45	40	60

S.no.	Unit Title	No. of Periods	CO'S Mapped
1	Performance of single phase transformers	15	CO1
2	Sumpner's test and Scott connection	09	CO2
3	Parallel operation of transformers and Transformer oil testing	09	CO3
4	Performance of Alternators	12	CO4
Total Periods		45	

Course Objectives:

Course Objectives	i. To familiarise with the knowledge of different electrical machines to perform experiment. Ii. To conduct various experiments to know the performance characteristics. Iii. To reinforce theoretical concepts by conducting Relevantexperiments

Course outcomes:

Course outcomes	**CO1**	Conduct various tests on transformer to assess the performance.
	CO2	Conduct Sumpner's and Scott connection testson transformers for analysing its performance.
	CO3	Conduct suitable tests on Transformers to observe load sharing during parallel operation and dielectric strength of transformer oil.
	CO4	Conduct of various tests on Alternator to know the performance.

Learning outcomes:

Performance of single phasetransformers.

1. Conduct load test on 1-phase Transformer and calculate efficiency andregulation
2. Conduct the following two tests on 1-phaseTransformer
   I) O.C. test ii) S.C. tests and from theresult
   a) Draw the equivalentcircuit.
   b) Calculate efficiency at various loads and powerfactor
   c) Find the load at which maximum efficiencyoccurs.
   d) Calculate All-day efficiency for the given load cycle of 24hours.

Sumpner'stestandScottconnection

3. Obtain the efficiency and regulation of two similar 1-phase transformers by conducting sumpner'stest.
4. Conduct Scott connection (T- connection) ontransformers.

Parallel operation of transformers and oil testingkit

5. Connect two identical 1-ph transformers in parallel and observe the loadsharing.
6. Conduct oil testing using oil testing kit to know the dielectric strength of transformer oil.

Alternators

7. Conduct (direct) load test on Alternator and obtain voltageregulation.
8. Obtain the regulation of Alternator by using synchronous impedancemethod.
9. Synchronise the given Alternator with supply mains by using bright lampmethod.

Key competencies to be achieved by the student

S.No	Experiment title	competencies	Key competencies
1	Test the given single phase transformer i) Loadtest ii) O.C.test iii) S.C.test	• Draw the required circuitdiagram. • Identify the different terminals of the given 1-ph transformer. • Interpret the name platedetails. • Select proper supplyterminals. • Select proper range and type ofmeters. • Make connections as per circuitdiagram. • Follow the precautions to be taken (ex: Check for loose and/or wrong connections if any and rectify). • Follow the instructions and increase the given load gradually and tabulate theobservations. • Draw the efficiency curve and locatethe • maximum efficiency point.	• Identify the different terminals of 1-ph transformer. • Select proper range and type ofmeters • Increase the given loadgradually.
2	(i) Conduct Sumpner'stest (ii) PerformScott connection (iii)Conduct parallel operation of the given singlephase Transformers iv) Testing of transformer oil	• Select proper range and type ofmeters. • Make connections as per circuitdiagram. • Followtheinstructionsandperformsumpner's test by giving required rated voltage on primary side. • Check for series opposition (back to back) connection on secondaryside. • Give required reduced voltage on secondaryside. • Tabulateobservations. • Calculate efficiency andregulation. • Identify main and teaser trans formers and their terminals • Give the required 3-phsupply. • Take readings on both 3-ph and 2-phside. • Interpret the readings and verify 3-ph to 2-ph transformation. • Conduct polarity test and ascertain the relative polarities of secondary windings for parallel operation ofTransformers. • To know the di-electric strength of transformer oil	• Give required rated voltage on primary side. • Check for series opposition (back to back) connection on secondaryside. • Identify main and teaser trans formers and theirterminals

3	Test the Performance of Alternators	• Draw the circuit diagram for loadtest • Identify the different terminals of 3-ph Alternator, exciter and primemover. • Interpret the name platedetails. • Select proper supply for prime mover andexciter. • Select proper range and type ofmeters. • Make connections as per circuitdiagram. • Increase the given load gradually and tabulate the observations. • Calculate regulation at eachload. • Select proper supply for armature resistancetest. • Make connections for armature resistancetest. • Give required voltage, take readings andobtain armature resistance. • Calculate synchronous impedance andregulation. • Give required fieldcurrent. • For bright lamp method, synchronise the alternators when all the conditions aresatisfied	• Select propersupply for prime mover and exciter. • Select proper supply for armature resistance test • For bright lamp method, Synchronise thealternators

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-409A.1	3		1					3	1	
EE-409A.2	3		1					3		
EE-409A.3	3				1			3		
EE-409A.4	3	2	1		1			3	1	
EE-409A.5	3							3		
Average	**3**	**2**	**1**		**1**			**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

COURSE CONTENT

Performance of single phasetransformers:

Load test on 1-ph transformer - obtaining the equivalent circuit parameters, calculate efficiency, regulation, All-day efficiency of 1-ph transformer by conducting O.C. and S.C. tests.

Sumpner'stestandScottconnection:

Obtainingtheefficiencyandregulationoftwosimilar1-phasetransformersbyconductingsumpner's test - scott connection (T- connection) on transformers. Connect two 1-ph transformers in parallel and observing the loadsharing

Parallel operation of Transformers and Transformer Oil testing:

Parallel operation of 1-Ø transformers – Load sharing - Transformer Oil testing

Alternators:

Load test on Alternator – obtain the regulation of alternator by using synchronous Impedance method – Synchronisation of the given Alternator with supply mains by using bright lamp method.

FIELD PRACTICE IN ELECTRICAL ENGINEERING

Course code	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-409(B)	FIELD PRACTICE IN ELECTRICAL ENGINEERING	03	45	20	30

S.No.	Unit Title	No. of Periods	CO'S Mapped
1.	Maintenance /Charging of the Batteries	3	**CO1,CO6**
2.	Rewinding of single phase induction motors	9	**CO1**
3.	Installation and Testing of UPS . Installation and trouble shooting of CC camera wiring at domestic/commercial places.	3	**CO2**
4.	Installation and Testing of solar panels	6	**CO2**
5.	Estimation of Power loads	6	**CO4**
6.	Usage of fire extinguishers for different fire accidents.	3	**CO3**
7.	Industrial Visit to distribution substation	3	**CO5**
8.	Industrial visit to Solar power plant	3	**CO5**
9	Industrial visit to any Manufacturing/Processing industry	9	**CO5**
Total Periods		45	

Course Objectives:

Course Objectives	(i) To acquire knowledge on charging of batteries and maintenance of electrical appliances with safetyprocedures. (ii) To understand the installation and testing of UPS, CC Cameras, Inverters and Solar panels. (iii) To explore the knowledge in industries byvisits

Course outcomes:

Course outcomes	**CO1**	EE-409B.1	Perform the maintenance of batteries ,rewinding of motors, practice installation and testing of UPS and solar panels and CC camera wiring.
	CO2	EE-409B.2	Usage of different fire extinguishers.
	CO3	EE-409B.3	Design the layout of electrical installation and estimate the materialsrequired.
	CO4	EE-409B.4	Estimate the electrical power usage in industries, distribution of electrical energy and solar power plants by visiting them.
	CO5	EE-409B.5	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group.

Learning outcomes:

1. Carry out the Maintenance /Charging of theBatteries
2. Rewinding of single phase induction motor
3. Carry out the Installation work and Test the UPS for itsperformance and installation and trouble shooting of CC camera wiring at dometic/commercial places.
4. Carry out the Installation work and Test the solarpanels.
5. Estimate the Powerloads
6. Identify the fire-extinguishers to be used for different fireaccidents
7. Write a report on the Industrial visit - Distribution substation (33/11 KVSubstation).
8. Write a report on the Industrial visit to solar powerplant.
9. Write a report on the industrial visit to Manufacturing/ processingindustry.

Competencies & Key competencies to be achieved by the student

Sl. No	Experiment title	Competencies	Key Competencies
1.	Maintenance /Charging of the Batteries.	• RecordtheElectrical specifications of the Battery. • Remove the knobs and open thebattery. • Record the specific gravity of the Electrolyte of each cell using Hydrometer. • Note the level of Electrolyte in each cell. • Add the distilled water if necessary using afunnel. • Tighten the screws after closing the battery. • Record the Voltage of each cell using multi-meter. • Keep the ventilating plugs open while charging if it is not a maintenance free battery. • Connect the battery to the Battery charger by selecting proper method (constant current, Constant voltage), andvoltage. • Observe the temperature of the battery aftercharging. • Clean the terminals and apply Grease/petroleum jelly to avoid • sulphation.	• Choose the correct battery rating. • Measure specific gravity of electrolyte. • Prepare the electrolyte.

2.	Rewinding of single phase induction motor	• Identification of various parts of single phase induction motor • Key differences between starting and running winding • Choosing right size of conductor • Choosing no of coils • Insulating the coils	• Check for any discrepancies. • Rectify thefaults
3.	Installation and Testing of UPS and installation and trouble shooting of CC camara wiring.	• Identify the rating of the UPS for a particular application. • Note the rating of UPS • Practice the sequence of operations of switching ON/OFF. • Identify and pick the right tools and accessories for installation. • Practice the installation. • Draw the connection diagram • Give the necessary Electrical connections by using standard methods and techniques. • Know the maintenance of UPS, batteries and their inter connections. • Test the UPS for its performance. • Know the installation and troule shooting of CC camera wiring.	• Identify the rating of the UPS for a particular application. • Giving Electrical connections. • Identify the places of CC camera installation and it s wiring.

5.	Installation and Testing of Solar panels	• Identify the solar collectorused. • Note the applications of solar energy in different areas like water heaters, driers, cookers, furnaces, Green houses, water distillation, and Electric PowerPlant. • Estimate the load • Identify the type of solar cell, different module, panel,rating of solar panel, and arrayconstruction. • Charge controller – identifying range-connections	• Installation of Solar panels as per the atmospheric conditions. • Connecting with the existing ups
6.	Estimation of Power loads	• Record the details of total load and layout of the Electrical installation. • Prepare the Electrical circuit layout. • List the quantity required and specifications of electricalmaterial. • List the different tools required to execute the installationwork. • Prepare the work schedule and identify theVendors. • Estimate the cost of material andlabour. • Execute the Electrical installation.(with dummy loads)	• Draw the Electrical wiring diagram. • Estimate the Materials, tools and labour cost for the work. • Identify the vendors. • Execute work schedules.
7.	Usage of fire extinguishers for different fire accidents.	• Identification of type ofExtinguisher • Study different types ofExtinguishers • Usage of extinguishers for particularsituation.	• Identify the type of fire accident and take necessaryaction

8	Submit a Report on Study of Distribution substation (Visit)	• Draw the layout of Substation. • Record the technical specifications of each equipment (Incoming and outgoing feeders, Bus-bar, Lightning arrester, Circuit breakers, Isolators, Protective relays, Current transformers, Potential transformers, Metering and Indicating instruments used, Distribution Transformers, Wave trappers, capacitor banks, Batteries, Earth switchesetc.) • Note the staff structure and duties of each staff and day to day activities carried by staff. • Record the maintenance procedures adopted as per IS code and note typical earth resistance values. • Record the preventive maintenance schedule of all substation equipment • Record the details of frequent faults/breakdowns occurred. • Note the safety equipments used and precautions tobe taken.	• Drawing the layout of substation. • Obtain the knowledge of every equipments used in substations. • Understand the duties and functions of staff working at the substation. • Understand the various faults occurring frequently and safety equipmentsused.
9	Submit a Report on Study of Solar power plant (Visit)	• Draw the layout of solar powerplant. • Record the technical specifications of battery storage, converter and invertersused • Note the staff structure and dutiesof	• Drawing the layout of solar powerplant. • Obtain the knowledge of every equipments used in solar powerplant. • Understandthe

		• each staff and day to day activities carried by staff. • Record the maintenance procedures adopted as per IScode • Record the details of frequent faults/breakdowns occurred. • Note the safety equipments used and precautions tobe taken.	duties and functions of staff working in the plant. • Understand the various faults occurring frequently and safety equipmentsused.
10	Submit a Report on Study of Manufacturing/Processing(Visit)	• Identify the type of manufacturing/ processingunit • Identify the motors used for manufacturing/ processing • Draw the electrical layout of the manufacturing/ processingunit • Note the staff structure and duties of each staff and day to day activities carried by staff. • Record the maintenance procedures adopted as per IScode • Record the details of frequent faults/breakdowns occurred. • Note the safety equipments used and precautions to be taken.	• understandthe • motors used for • manufacturing/ • processing unit • Drawthe • electrical layout • of the • manufacturing/ • processingunit • Understandthe • various faults • occurring • frequently and • safety • equipments used.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-409B.1	3	1						3	1	
EE-409B.2	3							3	1	
EE-409B.3	3		2					3		
EE-409B.4	3	1		2	1			3	1	
EE-409B.5	3	2						3		
Average	**3**	**1.33**	**2**	**2**	**1**			**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

Text Books:

1. B. L. Theraja - Electrical Technology - Vol I To IV S. Chand & Co., New Delhi
2. B. V. S. Rao - Operation & Maintenanceof Electrical Machines Vol – I -Media Promoters & Publisher Ltd.Mumbai
3. B. V. S. Rao - Operation & Maintenance off - Electrical Machines Vol –II -Media Promoters & publisher Ltd.Mumbai
4. C.J. Hubert -Preventive Maintenance- Hand Books &Journals

ELECTRONICS ENGINEERING LABORATORY

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-410	ELECTRONICS ENGINEERING LAB	3	45	40	60

COURSE OUTCOMES MAPPING

S.No	Major Topics	No. of periods	CO's Mapped
1.	Semiconductor Devices	6	CO1
2.	Power Supplies	9	CO2
3.	Amplifiers	6	CO3
4.	Oscillators	9	CO4
5.	Linear Integrated Circuits	6	C05

COURSE OBJECTIVES	i. To impart adequate knowledge on electronic devices and circuits.
	ii. To develop skills of using amplifier and oscillators.
	iii. To enable effective usage of linear integrated circuits.

COURSE OUTCOMES	CO1	EE-410.1	Plot the characteristics of electronic devices.
	CO2	EE-410.2	Construct rectifier and onbtain different parameters.
	CO3	EE-410.3	Construct amplifiers and obtain different parameters.
	CO4	EE-410.4	Construct oscillators and obtain output waveforms.
	CO5	EE-410.5	Construct the circuit using Op-amp and observe the waveform.

LEARNING OUTCOMES

Semiconductor Devices

1. Plot the VI characteristics of PN junction diode.
2. Plot the VI characteristics of Zener diode.
3. Plot the Input and Output characteristics of NPN transistor in Common Emitter configuration.
4. Plot the VI characteristics of Photo Diode
5. Plot the VI characteristics of LDR

Power Supplies

6. Implement Half Wave rectifier with and without filter.
7. Implement Full Wave rectifier with and without filter.
8. Implement Bridge Wave rectifier with and without filter.
9. Build a regulated power supply with (a) Zener Diode and (b) Voltage Regulator IC.

Amplifiers

10. Plot the frequency response characteristics of RC coupled amplifier.

Oscillators

11. Measure the frequency of Hartley oscillator.
12. Measure the frequency of Colpitts oscillator.

Linear Integrated Circuits

13. Implement Inverting Amplifier with IC 741 OpAmp.
14. Implement Inverting Integrator with IC 741 OpAmp.
15. Implement Astable Multivibrator with IC 555 Timer.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-410.1	3		2					3		
EE-410.2	3							3		
EE-410.3	3		1					3		
EE-410.4	3		1					3		
EE-410.5	3		1					3		
Average	**3**		**1**					**3**		

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note : 1. This Lab is to be handled by Electronics & Communication Engg. faculty

2. Paper setting and paper evaluation is also to be done by Electronics & Communication Engg Faculty.

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Semiconductor Devices

VI characteristics of PN junction diode - VI characteristics of Zener diode - Input and Output characteristics of NPN transistor in Common Emitter configuration - VI characteristics of Photo Diode - VI characteristics of LDR

Power Supplies

Half Wave rectifier with and without filter - Full Wave rectifier with and without filter - Bridge Wave rectifier with and without filter - Regulated power supply with (a) Zener Diode and (b) Voltage Regulator IC.

Amplifiers

Frequency response characteristics of RC coupled amplifier.

Oscillators

Measure the frequency of Hartley oscillator - Measure the frequency of Colpitts oscillator.

Linear Integrated Circuits

Inverting Amplifier with IC 741 OpAmp - Inverting Integrator with IC 741 OpAmp – Astable Multivibrator with IC 555 Timer.

V SEMESTER

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS

V Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period/Sem	Scheme of Examination			
		Theory	Practical /Tutoral		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
EE- 501	Industrial Management &Smart Technologies	4	-	60	3	20	80	100
EE- 502	Electrical Machines- III (A.C Motors and Drives)	4	-	60	3	20	80	100
EE- 503	Power Systems – III (Switch Gear & Protection)	4	-	60	3	20	80	100
EE- 504	Power Electronics, PLC & SCADA	4	-	60	3	20	80	100
EE- 505	Digital Electronics & Micro Controllers	4	-	60	3	20	80	100
EE- 506	Electrical Utilization and Traction	4	-	60	3	20	80	100
PRACTICAL								
EE-507	Electrical Machines – III Laboratory	-	3	45	3	40	60	100
EE-508	Life skills	-	3	45	3	40	60	100
EE-509	(a) PLC &SCADA		3	45	1½	20	30	50
	(b) Power Electronics & MAT Lab Practice	-	3	45	1½	20	30	50
EE-510	Digital Electronics & Micro Controllers Lab	-	3	45	3	40	60	100
EE-511	Project Work	-	3	45	3	40	60	100
	TOTAL	**24**	**18**	**630**		**320**	**780**	**1100**

INDUSTRIAL MANAGEMENT & SMART TECHNOLOGIES

Course Code	Course Title	No of Periods/Week	Total Number of Periods	Marks for FA	Marks for SA
EE-501	Industrial Management & Smart Technologies	4	60	20	80

S.no	Unit Title	No.of Periods	CO'S Mapped
1	Basics of Industrial Management	**8**	CO1
2	Organisation structure & Organisational behaviour	**10**	CO1
3	Production and Material Management	**12**	CO2
4	Industrial Safety Management	**6**	CO2
5	Entrepreneurship Development	**8**	CO3
6	Total Quality Management	**6**	CO4
7	Smart technologies	**10**	CO5
Total Periods		**60**	

COURSE OBJECTIVES:

COURSE OBJECTIVES	i. To familiarise the concepts of management, ownership styles and organisationstructures. Ii. To get Exposure to organisational behavioural concepts, basics of Production management and materials management in industries. Iii. To Understand the modern trends of management inindustries using Smart technologies and maintaining quality systems.

COURSE OUT COMES:

COURSE OUT COMES	**CO1**	EE-501.1	Analyzethe concept of management,organizations applied to industry
	C02	EE-501.2	Analyse different aspects of production, materials and safety management activities at industries.
	C03	EE-501.3	Describe the role of entrepreneur in economic development and in improving the quality of life
	CO4	EE-501.4	Explain about the maintaining of quality standards of the product
	CO5	EE-501.5	Understand and applying smart technologies

Learning Objectives

Basics of IndustrialManagement

1.1 Define industry, commerce (Trade) andbusiness.
1.2 Know the need formanagement.
1.3 Understand the evolution and functions ofmanagement
1.4 Explain the principles of scientificmanagement.
1.5 Explain the principles ofmanagement.
1.6 Understand the nature of management as aprofession
1.7 Differentiate between supervisory, middle and Top levelmanagement
1.8 Explain the importance of managerial skills (Technical, Human,Conceptual)

Organisation Structure & organisationalbehaviour

2.1 Understand the philosophy and need of organisation structure of anindustry.
2.2 Understand the line, staff and Line & staff (Functional)organisations
2.3 Understand the differences between Delegation anddecentralization
2.4 Explain the factors of effectiveorganisation.
2.5 State motivationtheories.
2.6 StateMaslow'sHierarchyofneeds.
2.7 List out different leadershipmodelsand explain democratic, autocratic and free-rein style leadership.
2.8 Know the concept of Job analysis, Job description andspecifications.
2.9 Understand the process of recruitment, selection.
2.10 Understand types of businessownerships.

Productionand Material management

3.1 Define production and explain its types(single, batch and mass production)
3.2 Explain the stages of Production, planning andcontrol.
3.3 Know the basic methods demandforecasting
3.4 Explain Break EvenAnalysis
3.5 Draw PERT/CPM networks.
3.6 Solve the criticalpath in simple project
3.7 Know Functions of Materials Management
3.8 Explain ABCanalysis.
3.9 Define safetystock and reorderlevel.
3.10 Derive an expression for economic orderingquantity.
3.11 List out storesrecords.
3.12 Explain the Bincard and Cardexmethod.
3.13 Explain general purchasingprocedures.
3.14 List out purchaserecords.

IndustrialSafety Management

4.1 Explain the importance of safety at Work place.
4.2 Explain hazard andaccident.
4.3 List out different hazards in theIndustry.
4.4 Explain the causes ofaccidents.
4.5 Explain the direct and indirect cost ofaccidents.

EntrepreneurshipDevelopment.

5.1 Define the wordentrepreneur.
5.2 Explain the requirements of anentrepreneur.
5.3 Determine the role of entrepreneurs in promoting Small ScaleIndustries.
5.4 Describe the details of self-employmentschemes.
5.5 Characteristic of successfulentrepreneurs
5.6 Explain the method of siteselection.
5.7 List the financial assistanceprogrammes.
5.8 List out the organisations that help anentrepreneur
5.9 Know the use of EDPProgrammes
5.10 Understand the concept of make in India, Zero defect and zeroeffect
5.11 Understand the importance forstartups
5.12 Explain the conduct of demandand market surveys
5.13 Prepare feasibility report of any start-up plant/processing industry

Total Quality Management

6.1 Explain the concept ofquality.
6.2 List the quality systems and elements of qualitysystems.
6.3 State the principles of qualityAssurance.
6.4 Understand the basic concepts ofTQM
6.5 Know the Pillars ofTQM
6.6 List the evolution of ISOstandards.
6.7 Explain ISO standards and ISO 9000 series of qualitysystems.
6.8 List the beneficiaries of ISO9000.
6.9 Explain the concepts of ISO14000
6.10 Know the overview of PDCAcycle

SmartTechnologies

7.1 Get an overview ofIoT
7.1.1 Define the termIoT
7.1.2 Know how IoTwork
7.1.3 List the key features ofIoT
7.1.4 List the components of IoT : hardware, software, technology andprotocols
7.1.5 List the advantages and disadvantages ofIoT
7.1.6 Smart Energy and the SmartGrid

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-501.1	3					1		3		
EE-501.2	3		1		1	1		3		
EE-501.3	3					1		3		3
EE-501.4	3	2				1		3	1	
EE-501.5	3		2	1		1		3		
Average	**3**	**2**	**1.5**	**1**	**1**	**1**		**3**	**1**	**3**

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HyponatedCourse Content

1. **Basics of IndustrialManagement**
   Introduction: Industry, Commerce and Business; Definition of management, Evolution and functions of management, Principles of scientific management: – F.W.Taylor, Principles of Management: Henry Fayol; Nature of management; levels of management; managerialskills.

2. **Organisation Structure & organisationalbehaviour**
   Organizing - Process of Organizing; Line/Staff and functional Organizations, Decentralization and Delegation, Effective Organizing; Motivational Theories; Leadership Models and types of leadership styles Forms of Business ownerships: Types – Sole proprietorship, Partnership, Joint Stock Companies, Job analysis – process of recruitment and selection, Cooperative types of Organizations.

3. **Productionand Material management**
   Definition of production– Types of production- job, batch and mass -Production Planning and Control: Demand forecasting, Break even analysis; CPM and PERT techniques; simple numericalproblems-Materials in industry, ABC Analysis, Safety stock, re-order level, Economic ordering quantity, Stores Management:Stores records, purchasing procedures, purchase records, Bin card, Cardex

4. **IndustrialSafety Management**
   Importance of Safety at work places; Causes of accidents-Indirect and Direct costs of accidents-different hazards.

5. **EntrepreneurshipDevelopment.**
   Definition of Entrepreneur; Role of Entrepreneur; Concept of Make In India, ZERO defect, Zero Effect, Concept of Start-up Company, Entrepreneurial Development: Role of SSI, MSME, DICs, Entrepreneurial development schemes; Institutional support, financial assistance programmes – Self employment schemes - Market survey and Demand survey; Preparation of Feasibility studyreports.

6. **Total Quality Management:**
   Introduction to Total Quality Management (TQM)- Concept of quality discussed by B. Crosby W. Edward, Deming, Joseph M. Juran, Kooru Ishikawa, Genichi Taguchi, Shigco Shingo. Quality systems – Definitions of the terms used in quality systems like, quality policy, quality management, quality systems, Stages of development of ISO 9000 series , ISO-14000, Deming's PDCA Cycle (Plan, Do, Check and Action). Japanese Quality Management, culture, Kaizen Strategy (continuous improvement).

7. **Smart Technologies**:
   Overview of IoT - Define IoT, how IoT work, key features of IoT, components of IoT : hardware, software, technology and protocols, advantages and disadvantages of IoT - IoT Applications - Smart Energy and the Smart Grid.

REFERENCE BOOKS

1. O.P.Khanna-Industrial Engineering and Management-Dhanpat Rai publications
2. Elwood S Buffa-Modern Production Management- Wiley India Pvt.Ltd.
3. T.R.Banga&Sharma-Engineering Economics and Management Science.
4. S.N.Chary-Production and Operations Management –McGraw Hill Education
5. Converging_Technologies_for_Smart_Environments_and_Integrated_Ecosystems_IERC_ Book_Open_Access_2013 pages-54-76

Blue Print of the Question Paper

S.No	Unit Name	Periods Allocated	Weightage Allocated		Marks Wise Distribution of Weightage				Question Wise Distribution of Weightage				CO's Mapped
					R	U	Ap	An	R	U	Ap	An	
1	Basics of Industrial Management	**8**	11	*	0	3	8	*	0	1	1	*	**CO1**
2	Organisation structure & Organisational behaviour	**10**	11	*	3	0	8	*	1	0	1	*	**CO1**
3	Production and Material Management	**12**	14	*	3	3	8	*	1	1	1	*	**CO2**
4	Industrial Safety Management	**6**	6	*	3	3	0	*	1	1	0	*	**CO2**
5	Entrepreneurship Development	**8**	11		3	0	8		1	0	1		**CO3**
6	Total Quality Management	**6**	6		3	3	0		1	1	0		**CO4**
7	Smart technologies	**10**	11		3	0	8		1	0	1		**CO5**
Total		**60**	**70**	**10 ***	**18**	**12**	**40**	**10***	**6**	**4**	5	**1**	

R - Remember; U - Understanding; Ap - Application; An – Analysing

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.14
Unit Test-II	From 4.1 to 7.2

Model Papers: Syllabus to be Covered for Unit Tests

MODEL PAPER – FORMATIVE ASSESMENT-1

C-20-EE-501

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-501 : INDUSTRIAL MANAGEMENT AND SMART TECHNOLOGIES

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.

ii. First question carries four marks and remaining each question carries three marks.

iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. Define the terms

   (a) Industry

   (b) Business

   (c) Management

   (d) Commerce. **(CO1)**

2. List the advantages of line organization. **(CO1)**

3. State the functions of material management. **(CO1)**

4. List different types of business ownerships. **(CO1)**

5. State the advantages of sole proprietorship organization. **(CO2)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.

ii. Each question carries eight marks.

iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain the functions of management. **(CO1)**

   (OR)

   (b) State the principles of scientific management. **(CO1)**

7. (a) Explain the different process of recruitments. **(CO1)**

   (OR)

   (b) State the advantages and disadvantages staff organization. **(CO1)**

8. (a) Explain break-even analysis. **(CO2)**

   (OR)

   (b) Explain ABC analysis. **(CO2)**

***

C-20-EE-501

MODEL PAPER – FORMATIVE ASSESMENT-2

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-501 : INDUSTRIAL MANAGEMENT & SMART TECHNOLOGIES

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all **five** questions.
ii. First question carries **four** marks and remaining each question carries **three** marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Define Entrepreneur.

   (b) TQM stands for _____

   (c) Define Quality system.

   (d) Define IoT (Internet of Thing) **(CO2, CO3,CO4,CO5)**

2. List any three causes of accidents. **(CO2)**
3. State the requirements of Entrepreneur. **(CO3)**
4. List the beneficiaries of ISO 9000. **(CO4)**
5. Write the main components of IoT. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all **three** questions.
ii. Each question carries **eight** marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain Direct and Indirect Cost of Accidents. **(CO2)**

   (or)

   (b) Explain the method of site selection for establishing a plant . **(CO3)**

7. (a) Explain the different EDP programmes. **(CO3)**

   (or)

   (b) Explain ISO standards and ISO 9000 series of quality system. **(CO4)**

8. (a) List the advantages and disadvantages of IoT. **(CO5)**

   (or)

   (b) Explain the application of SMART Energy system . **(CO5)**

***

MODEL PAPER – SUMMATIVE EXAMINATION

C-20-EE-501

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-501 : INDUSTRIAL MANAGEMENT AND SMART TECHNOLOGIES

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. Define Industry and Business. **(CO1)**
2. State the advantages of line organization. **(CO1)**
3. State the functions of material management. **(CO2)**
4. List the various types of purchase records. **(CO2)**
5. State the causes of accidents in industries. **(CO2)**
6. Write the differences between PERT and CPM. **(CO3)**
7. State the characteristics of successful entrepreneur. **(CO3)**
8. Define quality and quality system. **(CO4)**
9. List the beneficiary companies of ISO 9000. **(CO4)**
10. List the components of IoT. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11.(a) Explain the principles of scientific management. **(CO1)**

(OR)

(b) Explain the functions of management. **(CO1)**

12.(a) Explain the advantages and disadvantages of line and staff organization. **(CO1)**

(OR)

(b) Explain different types of leadership styles. **(CO1)**

13.(a) Explain the ABC analysis in material management. **(CO2)**

(OR)

(b) For a certain project the data is given below **(CO2)**

S.No.	1	2	3	4	5	6	7	8
Activity	1-2	1-3	1-4	2-4	2-5	3-6	4-6	5-6
Duration (months)	6	8	5	3	5	12	8	6

(i) Draw the network diagram.
(ii) Identify the critical path.
(iii) Find the project duration

14. (a) Explain any two self employment schemes. **(CO3)**

(OR)

(b) Explain role of enterprenuer in national development. **(CO3)**

15. (a) Explain the application of IoT in the field of energy. **(CO5)**

(OR)

(b) Explain the advantages and disadvantages of IoT. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. This question carries ten marks.

ii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

16. Why in the line and staff organisation structure preferred in large sacle industries. **(CO3)**

***

ELECTRICAL MACHINES-III
(A.C MOTORS AND DRIVES)

Course code	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-502	ELECTRICAL MACHINES-III (A.C MOTORS AND DRIVES)	4	60	20	80

S. No.	Unit Title	No. of Periods	CO'S Mapped
1	3- Phase Induction Motors	20	CO1
2.	Fractional Horse Power Motors	10	CO2
3	Synchronous Motors	10	CO3
4.	Electrical Drives	12	CO4
5.	Braking of Electrical Motors	8	CO5
Total		60	

Course Objectives:

Course Objectives	i)To understand the working of synchronous motor, three phase and single phase Inductionmotors ii)To study the torque- speed and torque - slip characteristics of induction motors iii)To understand the electrical drives and their fields ofapplications.

Course outcomes:

Course Outcomes	**CO1**	EE-502.1	Analyze the features of 3 phase induction motor.
	CO2	EE-502.2	Describe various types of Fractional Horse Power motors.
	CO3	EE-502.3	Analyze the features of synchronous motor and its behaviour for various excitations.
	CO4	EE-502.4	Select suitable electrical drive for different industrial applications.
	CO5	EE-502.5	Explain different braking methods for DC shunt motors.

LEARNING OUTCOMES:

1.0 phase InductionMotors,

1.1 Principle of Production of Rotating Magnetic Field in 3-phaseSystem.
1.2 Explain the construction of Induction motor- slip ring and squirrelcage
1.3 Compare Slip ring & Squirrel cage Inductionmotors.
1.4 State the principle of working of 3 phase inductionmotor.
1.5 Explain working of 3 phase induction motor oni)no-loadand ii) Load.
1.6 Derive the expression relating TORQUE, POWER andSLIP.
1.7 Draw Torque – Slipcurves.
1.8 Explain(i)No-loadtest(ii) Blockedrotortestand draw circle diagram with the help of abovetests and solve problems.

1.9 State the Starters used for different ratings of induction motors.
1.10 Explain the working of the following starters with the help of circuitdiagram.
(i) D.O.L.starter (ii) Star/Delta Starter
(iii) Auto – Transformerstarter (iv) Rotor resistance starter
1.11 Explain the speed control of inductor motorsby
(i) Frequencychangingmethod (ii) Pole changingmethod.
(iii)Injecting voltage inrotor circuit. (iv)Cascading
1.12 State the advantages of inductionmotors
1.13 List at least six applications of inductionmotors
1.14 Compare synchronous motors with induction motors.

Fractional H.P motors.

2.1 List the types of 1- phasemotors.
2.2 Explain why a Single-phase Induction motor is not a Self startingmotor.
2.3 Explain the working principle of 1 – phase Induction motorby
(i) Crossfieldtheoryii) Double field revolvingtheory
2.4 Explain the construction and working of the following 1-phase induction motors
i) with legiblesketch (ii) Splitphasemotor(iii) capacitor start motor
iv) shaded polemotor
2.5 Explain the construction and working of the following types of 1- phase Commutator motors (i) A.C.Seriesmotors (ii) universalmotors.
2.6 List the types of Steppermotors.
2.7 Listapplicationsof
(i) 1-phaseinductionmotors (ii)1-phase Commutator motors (iii)Steppermotors.

Synchronousmotors

3.1 Explain the construction of synchronous motor and its parts with legiblesketch.
3.2 Explain the principles of working of synchronousmotors.
3.3 Explain the effects of varying excitation at constant load with phasordiagrams,
3.4 Explainthesignificanceandaccountfortheshapeof'V'curves,InvertedVcurve,
3.5 Explain how a Synchronous motor can be used as a Synchronouscondenser.
3.6 Explain the phenomenon ofHUNTING.
3.7 State how HUNTING is prevented.
3.8 List the applications of synchronousmotor.

ElectricalDrives.

4.1 Define an ElectricDrive.
4.2 Explain the concept of ElectricDrive.
4.3 List the advantages of ElectricDrives.
4.4 Draw the block diagram of an Electricdrive.
4.5 State the function of each block in the block diagram of an Electricdrive
4.6 List the factors governing the selection of electricdrive.
4.7 Classify thedrives.
(i) Based ontheiroperation (ii)Based on theirapplication
4.8 State the advantages and disadvantages of different types ofdrives.
4.9 Distinguish between an AC Drive and a DCDrive.
4.10 State the types of loads for which drives areneeded.
4.11 Draw the loads for different ratings of motors and solve the problems.
4.12 State the need of loadequalization
4.13 State the use of flywheels

4.14 Suggest suitable motors for the following applications
(i) Steelmills(ii)sugarmills(iii)flourmills(iv)Cranes
(v) Lifts & Hoists(vi)Lathes(vii) Drilling andGrindingmachines
(viii) Pump sets (ix) Punches&Presses (x) Wood workingmachines
(xi)Printing (xii)Beltconveyor (xiii) Textilemills
(xiv) Paper mills (xv)Rollingmills(xvi)Shippropulsion(xvii)Mines(xviii) Cement works.
4.15 Explain the operation of the drive for the followingapplications.
(i) steel mills (ii) Cranes (iii) Pump set (iv) Lathe
4.16 Suggesta suitable motor for the drivefor followingapplications
(i)HardDisc (ii) ComputerPrinter (iii) Robot arm (iv)CNC machine.

Braking of electricmotors.

5.1 State different systems of braking of electricmotors.
5.2 State advantages of electric braking over other forms ofbrake
5.3 List different methods of electricbraking
5.4 Explain the methods of plugging, Rheostatic and Regenerative brakingfor D.C Shunt motor.
5.5 Solve Problems on theabove.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-502.1	3		1					3	1	
EE-502.2	3	1.5	1					3	1	
EE-502.3	3							3		
EE-502.4	3		1.5					3	1.5	
EE-502.5	3	1	1					3		
Average	**3**	**1.25**	**1.13**					**3**	**1.17**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENT

Three Phase InductionMotors

Introduction – Rotating Magnetic field - Construction of Induction motors – Comparison – working principle of three phase Induction motor – working of Induction motor at different conditions (Starting and Running) - Derive the relationship between Torque, Power and slip of Induction motor – Torque-slip characteristics –Testing of Induction motors – Drawing of Circle diagram - problems .- Starting methods of Induction motors- Types of starters –Methods of speed control of Induction motor – Advantages and applications of Induction motors- Comparison of Induction motor with Synchronous motor.

Fractional H.PMotors

Types of 1-phase motors – Reasons for not self-starting-working principle of 1-phase induction motors-Cross field and Double field revolving theory-Construction and working of split phase, capacitor start, capacitor run and shaded pole types – Essential parts and Constructional features of A.C series motor – principles of working – Universal motor- parts, constructional features, principle of working- Stepper motors – types- construction and principle of working - permanent magnet and Variable reluctance type motor –Applications of 1-phase motors.

SynchronousMotors

Introduction -, synchronous speed, parts of synchronous Motor – Excitation of rotor working Principle – Back EMF – Resistance and synchronous Reactance – Effects of change of Excitation at constant Load, Vector diagrams for: (a) Normal, (b)Under and c)Over excitation conditions, Effects of Excitation on Armature current and power factor, Relation between Back EMF, applied voltage - V – Curves and inverted V –curves,constant power lines – Hunting and its undesirable Effects – prevention of Hunting- Methods of Countering hunting, Applications of synchronous motor.

Electricaldrives

Definition and concept of Electric Drives -Advantages– factors governing selection of motors –nature of electric supply- DC & AC – Nature of Drives – Group drives- Individual drives their merits and demerits – Nature of load – analysis of type of load- Operations required – matching of motors with given loads - Rating of motors basing on temperature rise and load equalization – purpose of load equalization- use of Flywheel - Electric motors used in - Steel mills- Sugar mills - Flour mills- Cranes – Lifts -Hoists - Lathes - Drilling and Grinding machines - Pump sets - Punches & Presses - Wood working machines - Printing - Belt conveyor -Textile mills -Paper mills - Rolling mills - Ship propulsion -Mines - Cement works – Operation of drive for Steel mills-Cranes-Pump set – Lathes-Electric motor used in –Hard disc-Computer Printer-Robot arm-CNC machine.

ElectricBraking

Braking – Types of Braking – Merits & de-merits of Electrical braking – Plugging- Rheostatic braking – Regenerative braking applied to D.C shuntmotor- Problems of Electric braking.

REFERENCE BOOKS

1. B.L. Theraja,A.K.Theraja– A Textbook of Electrical Technology,Vol-II– S.Chand&Co.
2. J.B. Gupta –Theory and performance of Electrical machines-KATSON BOOKS
3. H. Cotton –ElectricalTechnology-CBS publishers and distributors
4. S.K.Pillai-A first course on Electrical Drives-New AGE International(P) Ltd. Publishers
5. Theodore Wilde-Electrical machines,Drives and Power systems-pearson
6. Audel-Electric motors-Rex Miller,Mark Richard Miller

Blue print:

S.No.	Unit title	No. of periods	Weightage allocated		Marks wise distribution of weightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1	3- Phase Induction Motors	20	22	*	6	8	8	*	2	1	1	*	CO1
2	Fractional Horse Power Motors	10	14		6	8	0		2	1	0		CO2
3	Synchronous Motors	10	9	*	9	0	0	*	3	0	0	*	CO3
4	Electrical Drives	12	14	*	6	0	8	*	2	0	1	*	CO4
5	Braking of Electrical Motors	8	11		3	8	0		1	1	0		CO5
Total		**60**	**70**	**10 ***	**30**	**24**	**16**	**10***	**10**	**3**	**2**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model papers: Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 2.7
Unit Test-II	From 3.1 to 5.5

MODEL PAPER – FORMATIVE ASSESMENT-1

C-20-EE-502

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-502 : ELECTRICAL MACHINES – III (AC MOTORS AND DRIVES)

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.

ii. First question carries four marks and remaining each question carries three marks.

iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) The speed of Synchronous motor is always less than Synchronous speed (True/False)
   (b) DOL starters generally used for the starting of Induction motors rated up to _____
   (c) The single phase Induction motors are self starting. (True/False)
   (d) During _____ braking the electric motors are made to run as generator. **(CO1)**
2. Compare three phase slip ring and squirrel cage Induction motors **(CO1)**
3. List at least six applications of three phase Induction motors. **(CO1)**
4. List the different types of single phase motors. **(CO2)**
5. What are the applications of stepper motors? **(CO2)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.

ii. Each question carries eight marks.

iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain the working principle of 3-phase Induction motor in detail. **(CO1)**

   (OR)

   (b) Explain in detail the relation between torque and slip of 3-phase Induction motor and also draw the torque-slip curve. **(CO1)**
7. (a) A 400 V 20 hp 50 Hz 6-pole three-phase induction motor gave these test results:
   No load test : 400 V, 11 A, p.f. = 0·2
   Blocked rotor test : 100 V, 25 A, p.f. = 0·4
   Rotor copper loss at stand still is half the total copper loss. **(CO1)**
   Draw the circle diagram and determine line current, power factor and efficiency at full load.

   (OR)

   (b) Explain the working manually operated star / delta starter and for an Induction motor with neat sketch. **(CO1)**
8. (a) Explain the working principle of split-phase 1-phase Induction motor with neat diagram and also draw the phasor diagram. **(CO2)**

   (OR)

   (b) Explain the working principle of operation of Shaded pole type 1-phase Induction motor with neat diagrams. **(CO2)**

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MODEL PAPER – FORMATIVE ASSESMENT-2

C-20-EE-502

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-502 : ELECTRICAL MACHINES – III (AC MOTORS AND DRIVES)

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) Synchronous Motor is a self starting motor : (True/False)
   (b) Power factor of a Synchronous Motor with under excitation is _____
   (c) Speed equation of Synchronous Motor is _____
   (d) Method to prevent hunting is _____ . **(CO3)**
2. What is synchronous condenser? **(CO3)**
3. Classify the drives based on their application **(CO4)**
4. State the need of load equalization **(CO4)**
5. State different systems of braking of Electric motors. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) State different duty cycles of drives and explain with neat sketches. **(CO4)**

   (or)

   (b) Draw the block diagram of an electric drive and state the function of each block in that diagram. **(CO4)**

7. (a) Explain how DC shunt motor is stopped by (i) Plugging and (ii) Rheostatic braking. **(CO5)**

   (or)

   (b) 220 V shunt motor drives a 725 N-m torque load when running at 1180 r.p.m. The armature resistance is 0·0075 W and shunt field resistance is 60 W. The motor efficiency is 90%. Calculate the value of the dynamic braking resistance that is capable of 400 N-m torque at 1000 r.p.m. The friction and windage losses are assumed to be constant at both speeds. **(CO5)**

8. (a) Explain the operation of the drive used in (i) Cranes and (ii) Lathe Machines. **(CO4)**

   (OR)

   (b) Distinguish between an AC Drive and a DCDrive in any eight aspects. **(CO4)**

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MODEL PAPER – SUMMATIVE EXAMINATION

C-20-EE-502

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-502 : ELECTRICAL MACHINES – III (AC MOTORS AND DRIVES)

Time: 3 hours Total Marks: 80

PART-A 10 X 3 = 30

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. Compare three phase slip ring and squirrel cage Induction motors. **(CO1)**
2. List at least six applications of three phase Induction motors. **(CO1)**
3. List the different types of single phase motors. **(CO2)**
4. What are the applications of stepper motors. **(CO2)**
5. List the various parts of a synchronous motor. **(CO3)**
6. Mention four applications of synchronous motor with reasons. **(CO3)**
7. What is synchronous condenser. **(CO3)**
8. Classify the drives based on their application **(CO4)**
9. State the need of load equalization **(CO4)**
10. State different systems of braking of Electric motors. **(CO5)**

PART-B 5 X 8 = 40

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) Explain the working principle of 3-phase Induction motor in detail. **(CO1)**

(or)

(b) Explain in detail the relation between torque and slip of 3-phase Induction motor and also draw the torque-slip curve **(CO1)**

12. (a) A 400 V 20 hp 50 Hz 6-pole three-phase induction motor gave these test results :
No load test : 400 V, 11 A, p.f. = 0·2
Blocked rotor test : 100 V, 25 A, p.f. = 0·4
Rotor copper loss at stand still is half the total copper loss.
Draw the circle diagram and determine line current, power factor and efficiency at full load. **(CO1)**

(or)

(b) Explain the working manually operated star /Delta starter and for an Induction motor with neat sketch. **(CO1)**

13. (a) Explain the working principle of split-phase 1-phase Induction motor with neat diagram and also draw the phasor diagram. **(CO2)**

(or)

(b) Explain the working principle of operation of Shaded pole type 1-phase Induction motor with neat diagrams. **(CO2)**

14. (a) State different duty cycles of drives and explain with neat sketches. **(CO4)**

(or)

(b) Draw the block diagram of an electric drive and state the function of each block in that diagram. **(CO4)**

15. (a) Explain how DC shunt motor is stopped by (i) Plugging and (ii) Rheostatic braking.**(CO5)**

(or)

(b) 220 V shunt motor drives a 725 N-m torque load when running at 1180 r.p.m. The armature resistance is 0·0075 W and shunt field resistance is 60 W. The motor efficiency is 90%. Calculate the value of the dynamic braking resistance that is capable of 400 N-m torque at 1000 r.p.m. The friction and windage losses are assumed to be constant at both speeds. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. This question carries ten marks.

ii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

16. Select a suitable three phase motor for an elevator . Justify your choice with relevant expressions and graphs. **(CO4)**

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POWER SYSTEMS-III (Switch Gear & Protection)

Coursecode	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-503	POWER SYSTEMS-III(Switch Gear & Protection)	4	60	20	80

S.no	Unit Title	No.of Periods	CO'S Mapped
1	**Switch Gear and Reactors**	**15**	CO1
2	**Protective Relays**	**8**	CO2
3	**Protection of Alternators andtransformers**	**15**	CO3
4	**Protection of Transmission Lines and Feeders**	**17**	CO4
5	**Modern trends in power systems**	**5**	CO5
	Total	**60**	

Course Objectives	(i) To understand the concept of switchgearequipment (ii) To comprehend the different protection schemes of equipment (iii) To familiarise the modern trends evolving in power systems.

Course outcomes	**CO1**	EE-503.1	Analyze the working of various circuit breakers.
	CO2	EE-503.2	Describe the construction of different protective relays.
	CO3	EE-503.3	Interpret various protection schemes used for the protection of alternators and transformers.
	CO4	EE-503.4	Analyse various protection schemes used for transmission lines and feeders.
	CO5	EE-503.5	Explain different modern grid systems used in power systems.

LEARNING OUTCOMES

Switchgear and Reactors

1.1 Define switch gear andclassify.
1.2 Define isolators, air break switches, their uses andlimitations.
1.3 Explain the phenomenon of arc, arc voltage, arc current and itseffects.
1.4 State factors responsible for arc and methods of arcquenching.
1.5 Classify the circuit breakers based upon medium of arcquenching.
1.6 State the principle of M.O.C.B and explain itsworking.
1.7 State properties of SF_6 gas, Explain its principle and working of SF_6 circuit breakers.
1.8 Explain principle and working ofA.B.C.B.

1.9 Compare M.O.C.B, SF_6 C.B andA.B.C.B.
1.10 Define current limiting reactors and state theirnecessity.
1.11 Draw the scheme of reactor connections and comparethem.
1.12 Types of faults in power systems and theireffects
1.13 Solve the problems on short circuit kVA,

ProtectiveRelays.

2.1 Define relay and State the basic requirements of relays.
2.2 Classify the relays based upon
(i) Principle of operation (ii) Time ofoperation (iii) Duty
2.3 Define current setting and time setting.
2.4 Explain the principle, construction, working and applications of
(i) Induction type over current relay
(ii) Directional over current induction type relay (iii) Impedance relay
(iv) Distance relay (v) Differential Relay

Protection of Alternator andTransformer

3.1 List the probable faults in Alternator Stator and rotor and mention their effects.
3.2 Describe the scheme of protection against excessive heating of stator and rotor. Mention the causes ofit.
3.3 Explain the differential protection for alternatorstator.
3.4 Explain the earth fault protection forrotor.
3.5 Explain the split phase protection of alternator against inter turn shortcircuits.
3.6 Explain the need and working of field suppressionprotection.
3.7 Listthepossiblefaultsandtheirtypesinatransformer–Explaintheireffect.
3.8 List the precautions to be taken for applying differential protection to transformers.
3.9 Explain differential protection oftransformer.
3.10 Explain the working of buchholtz relay in transformer.

Protection of Transmission Lines andfeeders

4.1 State the necessity of bus-bar protection, causes of bus-bar faults.
4.2 Explain the different schemes of protection for single and duplicate busbars.
4.3 Describe the transmission line protection and feederprotection.
4.4 Explain pilot wires and theireffects.
4.5 Explain the protection of transmission lines using distance and impedancerelays.
4.6 Explain the combined protection by using definite distance and time distancerelays.
4.7 Explain protection of radial feeders using time gradedfuses.
4.8 Explain protection of parallel feeders using directionalrelays.
4.9 Explain protection of ring main feeder using directionalrelays.
4.10 Explain differential protection for parallel feeders of transmissionlines.

Modern trends in powersystems

5.1 State Basic concept on distributed generation(Distributed energy resources).
5.2 Define Smart Grid and state itsneed
5.3 Explainthe working of SMARTGRID
5.4 Define Micro Gridand explain its operation
5.5 Define FACTS(Flexible AC transmission systems) and state itsapplications
5.6 State the Basic concept of Witricity (wirelesspower transmission)

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-503.1	3			1.5				3	1	
EE-503.2	3		1					3		
EE-503.3	3	2		1				3	2	
EE-503.4	3							3	1	
EE-503.5	3			1	1			3		
Average	**3**	**2**	**1**	**1.15**	**1**			**3**	**1.33**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Switch Gear andReactors.

Switch gear and their classification – Isolators, air break switches and explain the phenomenon of arc, arc voltage, arc current and their effects – Factors responsible for arc and arc quenching. Circuit breakers and their classification based on the medium of arc quenching – , M.O.C.B – Properties of SF_6 gas and principles of SF_6 circuit breakers – Working of A.B.C.B, M.O.C.B, SF_6 C.B and their comparisons. Reactors, – Current limiting reactors and their necessity. Types of reactors and their construction – Equation for short circuit KVA and solve problems.

ProtectiveRelays.

Requirements of relays – Classifications based on duty, principle of operation and time of operation – Construction and working of induction type over current relays – Directional Over current relay Principle, construction working of impedance, distance relay.

Protection of Alternators andtransformers

Protection of Alternators Scheme of protection probable faults in alternators against excessive heating of stator and rotor. Earth fault protection for stator and rotor – Split phase protection for alternator against short circuits. Field suppression protection. Protection of Transformer, Possible faults and their types in the transformer – Precautions required for protection – Differential protections of buchholz relay, protection against excessive heating of transformeroil.

Protection of Transmission Lines andFeeders,

Transmission line and feeder protection – Pilot wires, protection of transmission lines using distance and impedance relays. Combined protection using definite distance and time distance relays – Protection of radial feeders, parallel feeders, ring main feeders using time graded fuses directional relays

Modern trends in powersystems

DistributedGeneration- Smart Grid – MicroGrid - FACTS(FlexibleACtransmission systems) – Witricity(Wireless power Transmission)

Reference Books

1. Dr.S.L.Uppal,Prof.S.Rao- Electrical Power Systems-Khanna publishers
2. Sunil S.Rao - Switch gear and Protection-Khanna publishers
3. C.L.Wadhwa–Electrical Power Systems-New AGE International(P) Ltd. Publishers
4. J B Guptha–A Course in power systems-KATSON BOOKS
5. Narain G. Hingorani · LaszloGyugyi - Understanding FACTS-BSP BOOKS

Blue print:

S.No.	Unit title	No. of periods	Weightage allocated		Marks wise distribution of weightage				Question wise distribution of weightage				CO'S mapped
					R	U	Ap	An	R	U	Ap	An	
1	Switch Gear and Reactors	15	14	*	3	3	8	*	1	1	1	*	CO1
2	Protective Relays	8	11		3	0	8		1	0	1		CO2
3	Protection of Alternators and transformers	15	17	*	6	3	8	*	2	1	1	*	CO3
4	Protection of Transmission Lines and Feeder	17	22	*	3	3	16	*	1	1	2	*	CO4
5	Modern trends in power systems	5	6		3	3	0		1	1	0		CO5
Total		60	70	10*	18	12	40	10*	6	4	5	1	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.6
Unit Test-II	From 3.7 to 5.6

MODEL PAPER

Syllabus to be Covered for Unit Tests

MODEL PAPER – FORMATIVE ASSESMENT-1

C-20-EE-503

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-503 : POWER SYSTEMS – III (SWITCHGEAR AND PROTECTION)

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**

ii. **First question carries four marks and remaining each question carries three marks.**

iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) Isolator is operated on _____ load. **(CO1)**

(b) Circuit breaker is operated on faulty condition: True / False **(CO1)**

(c) Buchholz Relay is used for the protection of alternators: True / False **(CO3)**

(d) State the use of relay: _____ **(CO2)**

2. Classify the circuit breakers based on arc quenching medium. **(CO1)**

3. State the basic requirements of relay. **(CO2)**

4. Classify the different faults in an alternator. **(CO3)**

5. State any six properties of SF6 gas. **(CO1)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**

ii. **Each question carries eight marks.**

iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Explain the working of MOCB with diagram. **(CO1)**

(OR)

(b) Explain the working of SF6 circuit breaker with diagram. **(CO1)**

7. (a) Explain the working of induction type over current relay. **(CO2)**

(OR)

(b) Explain the working of distance relay. **(CO2)**

8. (a) Explain the differential protection for alternator stator. **(CO3)**

(OR)

(b) Explain the split phase protection scheme for an alternator against inter turn short circuits. **(CO3)**

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C-20-EE-503

MODEL PAPER – FORMATIVE ASSESMENT-2

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-503 : POWER SYSTEM – III (SWITCH GEAR & PROTECTION)

Time: 90 Minutes **Total Marks: 40**

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all **five** questions.
ii. First question carries **four** marks and remaining each question carries **three** marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Buchholz relay is used for protection of _____.

   (b) Distance relays are used for protection of _____ .

   (c) SMART grid system is used in obtaining Huge power generation : **True / False**.

   (d) Directional relays are used in Protection of Ring Main feeders : **True / False.**

   (CO3,CO4,CO5)

2. State the precautions to be taken while applying differential protection of Transformers. **(CO3)**
3. State the necessity of Bus-Bar protection system. **(CO4)**
4. State the effects of Pilot wire protection scheme. **(CO4)**
5. State the basic concepts of Wireless power transmission system. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all **three** questions.
ii. Each question carries **eight** marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain the differential scheme of protection of Transformers. **(CO3)**

   (or)

   (b) Explain the working of Buchholz relay in protection of Transformers. **(CO3)**

7. (a) Explain the protection transmission lines using distance relays. **(CO4)**

(or)

   (b) Explain the protection of Parallel feeders using directional relays . **(CO4)**

8. (a) Explain the working of SMART GRID with block diagram. **(CO5)**

   (or)

   (b) Define Micro Grid and explain its operation. **(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-503
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-503 : POWER SYSTEMS – III (SWITCHGEAR AND PROTECTION)

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. Define (a) Isolator (b) Circuit breaker. **(CO1)**
2. State any six properties of SF6 gas. **(CO1)**
3. Classify the relays based on working principle and time of operation. **(CO2)**
4. List the different types of faults in an alternator. **(CO3)**
5. State any three precautions to be adopted in differential protection of transformers. **(CO3)**
6. State any three uses of distance relays. **(CO3)**
7. State the necessity of bus-bar protection. **(CO4)**
8. List any three advantages of differential protection scheme. **(CO4)**
9. Define SMART grid. **(CO5)**
10. State any three applications of FACTS. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) Explain the construction and working of MOCB with diagram. **(CO1)**

(OR)

(b) Draw and explain the scheme of protection of generators using reactors. **(CO1)**

12. (a) Explain the working of directional over current relay with diagram. **(CO2)**

(OR)

(b) Explain the working of distance relay with diagram. **(CO2)**

13. (a) Explain the scheme of differential protection of transformers. **(CO3)**

(OR)

(b) Explain the scheme of protection against excessive heating of stator in an alternator. **(CO3)**

14. (a) Explain the protection of transmission lines using impedance relays. **(CO4)**

(OR)

(b) Explain the protection of parallel feeder using directional and non directional relay.**(CO4)**

15. (a) Explain the working of SMART grid with block diagram. **(CO5)**

(OR)

(b) Explain the basic concepts of wireless power transmission system. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**
ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. For what voltage level the SF6 circuit breakers are preferred.what are the resons ?**(CO1)**

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POWER ELECTRONICS, PLC AND SCADA

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-504	POWER ELECTRONICS,PLCAN D SCADA	4	60	20	80

COURSE OUTCOMES MAPPING

S.No	Unit Title	No. of periods	CO's Mapped
1.	Power Electronic devices	14	CO1
2.	Converters, AC Regulators & Choppers	12	CO2
3.	Inverters and Cycloconverters	10	CO3
4	Applications of Power Electronic circuits	10	CO4
5.	PLC and SCADA	14	CO5
	Total	**60**	

COURSE OBJECTIVES	i. To introduce students to the basic theory of power semiconductor devicesand passive components, their practical applications in power electronics.
	ii. To familiarize students to the principle of operation, design and synthesis ofdifferent power conversion circuits and their applications.
	iii.To provide strong foundation for further study of power electronic circuits and systems and To maintain PLCs and SCADA systems used in different applications.

COURSE OUTCOMES	**CO1**	EE-504.1	Describe basic operation of various powersemiconductor devices with the help of V-I characteristics.
	CO2	EE-504.2	Analyzethe working of various converters, AC voltage controllers and choppers with different loads.
	CO3	EE-504.3	Analyze Inverters and Cyclo converters with the help of wave forms.
	CO4	EE-504.4	Explain the speed control of DC motor using power semiconductor devices.
	CO5	EE-504.5	Design ladder diagrams for given applications using PLC.

LEARNING OUTCOMES

Power Electronic Devices

1.1 List different thyristors familydevices.
1.2 Draw the ISI circuit symbols for eachdevice.
1.3 Describe constructional details of SCR

1.4 Explain the Operation ofSCR.
1.5 Describe the two transistor analogy ofSCR.
1.6 Explain the Volt – Ampere characteristics of SCR with the help of adiagram.
1.7 Draw the Gate characteristics ofSCR
1.8 Mention the ratings ofSCR.
1.9 Give the advantages of SCR as aswitch.
1.10 Explain SCR circuit triggered byUJT.
1.11 List ten applications ofSCR.
1.12 Explain the construction of GTOSCR
1.13 Compare the characteristics of GTO SCR andSCR.
1.14 Explain the Volt-ampere characteristics of Diac under forward / reversebias.
1.15 Explain the Volt-ampere characteristics of Triac under forward / reversebias.
1.16 State the four modes of Triactriggering.
1.17 StatethenecessityofCommutationinSCR's
1.18 Explain various methods ofCommutation.

Converters, AC Voltage Controllers and Choppers.

2.1 Classifyconverters.
2.2 Explain the working of single-phase half wave converter with resistive and R-Lloads.
2.3 Understand need of freewheelingdiode.
2.4 Explain the working of single phase full wave converter with resistive and R- Lloads.
2.5 Explain the working of three-phase half wave converter with resistiveload
2.6 Explain the working of three phase full wave converter with resistiveload.
2.7 Explain the working of single phase AC voltage controller with resistiveload.
2.8 Explain the working of three phase AC voltage controller with resistiveload.
2.9 Compare AC voltage controller withtransformer.
2.10 Explain the working principle ofchopper.
2.11 Explain the control modes ofchopper.
2.12 Explain the operation of chopper in all fourquadrants.

Inverters and Cyclo-converters

3.1 Classifyinverters.
3.2 Explain the working of seriesinverter.
3.3 Explain the working of parallelinverter.
3.4 Explain the working of single-phase bridgeinverter.
3.5 Explain the working of three-phase bridgeinverter.
3.6 State the advantages of MOSFET based inverters over SCR basedinverters.
3.7 Applications ofInverters.
3.8 Explain the working principle ofCyclo-converter.
3.9 Explain the working of single-phase centre tappedCyclo-converter.
3.10 Applications ofCyclo-converter.

Applications of Power Electronic Circuits

4.1 List applications of power electroniccircuits.
4.2 Mention the factors affecting the speed of DCMotors.
4.3 Explain the speed control of DC Shunt motor usingconverter.
4.4 Explain the speed control of DC Shunt motor usingchopper.
4.5 Explain the speed control of PMDC motor usingconverter.
4.6 Explain the speed control of PMDC motor using chopper with Pulse WidthModulation.

4.7 Explain the speed control of PMDC motor using chopper with FrequencyModulation.
4.8 List the factors affecting speed of the ACMotors.
4.9 Explain the speed control of induction motor by using AC voltagecontroller.
4.10 Explain the speed control of induction motor by using converter and inverter (V/Fcontrol).
4.11 Devices used to suppress the spikes in supplysystem.
4.12 Working of UPS with blockdiagram.
4.13 Explain the illumination control circuit using TRIAC and DIAC with the help of a legible sketch.
4.14 Explain the anti-theft alarm circuit using SCR with the help of adiagram.
4.15 Explain the emergency lamp circuit using SCR with the help of adiagram.
4.16 Explain the battery charger circuit using SCR with the help of adiagram.
4.17 Explain the power factor improvement circuit using SCR with the help of adiagram.
4.18 Explain the DC circuit breaker using SCR with the help of adiagram.

PLC and SCADA

5.1 Need for automation and advantages of automation.
5.2 Define Programmable Logic Controller(PLC) and state the advantages ofPLC
5.3 Explain the different parts of PLC by drawing the Block diagram and state the purpose of each part.
5.4 State the applications ofPLC
5.5 Explain Ladderdiagram
5.6 Explain contacts and coils used inPLC
5.7 Draw ladderdiagramsfor
(i)ANDgate(ii)OR gate (iii) NOT gate
(iv) NAND gate (iv) NOR gate (iv) X-OR gate
5.8 Explain the following Timers and counters
(i)TON (ii)T OFF (iii) Retentivetimer (iv) CTU (v) CTD
5.9 Draw ladder diagrams using Timers andcounters
5.10 Explain PLC Instructionset
5.11 Explain ladder diagrams forfollowing
(i) DOL starter andSTAR-DELTAstarter (ii) Stair case lighting
(iii) Trafficlightcontrol (iv) TemperatureController
5.12 Explain the need of dataacquisition.
5.13 State the advantages of supervisorycontrol.
5.14 List the softwares used for SCADAandexplainthem.
5.15 State various communication methods used inSCADA.
5.16 Explain the working of SCADA withPLC and applications ofSCADA.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-504.1	3							3		
EE-504.2	3	2						3		
EE-504.3	3	2						3		
EE-504.4	3				1			3	1	
EE-504.5	3	1	2	1	1			3	1	
Average	**3**	**1.7**	**2**	**1**	**1**			**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Power Electronic Devices

Types of power semiconductor devices – SCR, DIAC, TRIAC - Construction, Working principle of all devices, symbols - Two transistor analogy for SCR – V-I & Gate characteristics, Forward break over voltage, latching current, holding current, turn on triggering time, turn off time - triggering of SCR using UJT- Necessity of Commutation- various methods of Commutation.

Converters AC Regulators &Choppers

Classification of converters, single phase half wave converter, freewheeling diode, single phasefullwaveconverter,threephasehalfwaveconverter,fullwaveconverter,singlephaseac voltage controller, three phase ac voltage controller, choppers – Different control modes of choppers - Four quadrant operation.

Inverters & Cyclo –converters

Classification of Inverters - series Inverter- parallel Inverter- Single Phase bridge Inverter – Three phase bridge Inverter – Cyclo-converter – basic principle of operation – Cyclo- converters - Applications of Cyclo-converters.

Application of Power ElectronicCircuits

DC Motor control - Speed control of DC shunt Motor by using converters and choppers - AC Motor Controls - speed control of induction Motor by using AC voltage controllers - V/F control (Converters and invertors control) - Devices used to suppress spikes in supply system.- Working of UPS with block diagram – Illumination Control Circuit - Anti theft alarm circuit - Emergency lamp - Battery charger Circuit using SCR - power factor improvement circuit - DC circuitbreaker.

PLC and itsapplications

PLC Definition-advantages-Block diagram-Ladder diagrams for AND, OR, NOT, NAND, NOR - Instruction set-Ladder diagram for DOL starter, Star-Delta Starter, Stair case lighting, Traffic light control, Temperature controller – Data Acquisition – Supervisory Control – SCADA softwares – Communication methods – SCADA with PLC - Applications of SCADA

REFERENCE BOOKS

1 .M.S.Jamil Asghar -Power Electronics– PHI, NewDelhi.

2. P.C.Sen.-Advanced PowerElectronics-Tata McGraw-Hill publishing company Ltd.,New Delhi

3. S.K.Bhattacharya,Brijindersingh-Control of ElectricalMachines-New AGE International(P) Ltd. Publishers

4. John Stevenson-Industrial automation and processcontrol

5. John W.Webb -Programmable Logiccontrol-pearson

6. P.S.Bhimbra-Power Electronics-Khanna publications

BLUE PRINT

S.No	Unit / Unit Title	No. of periods	Weightage Allocated		Markswise Distribution of Weightage				Questionwise Distribution of Weightage				CO's Mapped
					R	U	Ap	An	R	U	Ap	An	
1	Power Electronic devices	14	14		3	3	8		1	1	1		CO1
2	Converters, AC Regulators & Choppers	12	14	*	3	3	8	*	1	1	1	*	CO2
3	Inverters and Cycloconverters	10	14	*	3	3	8	*	1	1	1	*	CO3
4	Applications of Power Electronic circuits	10	14		3	3	8		1	1	1		CO4
5	PLC and SCADA	14	14	*	3	3	8	*	1	1	1	*	CO5
	Total	**60**	**70**	**10***	**15**	**15**	**40**	**10***	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.10
Unit Test-II	From 4.1 to 5.20

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-504
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-504 : POWER ELECTRONICS, PLC AND SCADA

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) TRIAC can be expanded as _____ .
   (b) Class-F Commutation circuit is used in _____ .
   (c) AC Voltage Controller converts DC into AC : True / False
   (d) Response time of MOSFET is _____ (less / more) than SCR. **(CO1)**
2. State the necessity of commutation of SCR. **(CO1)**
3. What is the need of Freewheeling Diode. **(CO2)**
4. Draw the circuit diagram of single phase AC Voltage Controller. **(CO2)**
5. List any three advantages of MOSFET based Inverter over SCR based Inverter. **(CO3)**

PART-B **3 x 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Explain VI Characteristics of SCR with the help of diagrams. **(CO1)**

   (OR)

   (b) Explain Class-C and Class-E commutation methods with the help of circuit diagrams.**(CO1)**

7. (a) Explain the working of Single Phase Fully Controlled Full Wave Converter with Resistive Load with the help of circuit diagram and waveform diagrams. **(CO2)**

   (OR)

   (b) Explain the control modes of a Chopper with the help of waveform diagrams. **(CO2)**

8. (a)Explain the working of Single Phase Bridge Inverter with the help of circuit diagram and waveform diagrams. **(CO3)**

   (OR)

   (b)Explain the working of Single Phase Bridge Cyclo Converter with the help of circuit diagram and waveform diagrams. **(CO3)**

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MODEL PAPER – FORMATIVE ASSESMENT-2
C-20-EE-504
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-504 : POWER ELECTRONICS, PLC AND SCADA

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) PWM is _____ frequency control .

   (b) Four quadrant control of a DC Motor can be achieved by _____ .

   (c) Logic gate used in Ladder Diagram of DOL Starter is OR gate : True / False

   (d)Abbreviation of PLC is _____ . (CO4, CO5)

2. List any three factors affecting the speed of an AC Motor. (CO4)
3. Draw the circuit diagram of Anti-Theft Alarm circuit using SCR. (CO4)
4. List any six applications of PLC. (CO5)
5. State any three advantages of Supervisory Control. (CO5)

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a)Explain the Speed Control of PMDC Motor using Single Phase Bridge Converter with the help of circuit diagram. (CO4)

   (OR)

   (b)Explain the working of Power Factor Improvement Circuit using SCR with the help of circuit diagram. (CO4)
7. (a)Draw and explain the PLC Ladder Diagram of Star-Delta Starter. (CO5)

   (OR)

   (b)Explain the working of SCADA using PLC with the help of diagram. (CO5)
8. (a) Explain the working of the power electronic circuit used in Battery Charger using circuit diagram. (CO4)

   (OR)

   (b)Explain the working of the power electronic circuit used in Anti-Theft Alarm using circuit diagram. (CO4)

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-504
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-504 : POWER ELECTRONICS, PLC AND SCADA

Time: 3 hours Total marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. Answer all questions.
ii. Each question carries three marks.
iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. List any six applications of SCR. **(CO1)**
2. State the necessity of commutation of SCR. **(CO1)**
3. What is the need of Freewheeling Diode. **(CO2)**
4. Draw the circuit diagram of single phase AC Voltage Controller. **(CO2)**
5. List any three advantages of MOSFET based Inverter over SCR based Inverter. **(CO3)**
6. List any three applications of Cycloconverter. **(CO3)**
7. List any three factors affecting the speed of an AC Motor. **(CO4)**
8. Draw the circuit diagram of Anti-Theft Alarm circuit using SCR. **(CO4)**
9. List any six applications of PLC. **(CO5)**
10. State any three advantages of Supervisory Control. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. Answer all five questions.
ii. Each question carries eight marks.
iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. (a)Explain VI Characteristics of SCR with the help of diagrams. **(CO1)**

(OR)

(b)Explain Class-C and Class-E commutation methods with the help of circuit diagrams. **(CO1)**

12. (a)Explain the working of Single Phase Fully Controlled Full Wave Converter with Resistive Load with the help of circuit diagram and waveform diagrams. **(CO2)**

(OR)

(b)Explain the control modes of a Chopper with the help of waveform diagrams. **(CO2)**

13. (a)Explain the working of Single Phase Bridge Inverter with the help of circuit diagram and waveform diagrams. **(CO3)**

(OR)

(b)Explain the working of Single Phase Bridge Cycloconverter with the help of circuit diagram and waveform diagrams. **(CO3)**

14. (a)Explain the Speed Control of PMDC Motor using Single Phase Bridge Converter with the help of circuit diagram. **(CO4)**

(OR)

(b)Explain the working of Power Factor Improvement Circuit using SCR with the help of circuit diagram. **(CO4)**

15. (a)Draw and explain the PLC Ladder Diagram of Star-Delta Starter. **(CO5)**

(OR)

(b)Explain the working of SCADA using PLC with the help of diagram. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**

ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16. Develop a ladder diagram for the following with three motors and a switch

I. All motors are ideal initially

II. Motor 1 is turned on with a switch

III. Motor 2 is turned on with a time delay of 10 sec from motor 1

IV. Motor 3 is turned on with a delay of 10 sec from motor 2 and motor 1 is turned off with turning on of motor 3

V. Motor 2 and motor 3 are turned off after a delay of 10 sec from motor 3 **(CO5)**

DIGITAL ELECTRONICS AND MICROCONTROLLERS

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-505	DIGITAL ELECTRONICS AND MICROCONTROLLERS	4	60	20	80

COURSE OUTCOMES MAPPING

S.No	Unit Title	No. of periods	CO's Mapped
1.	Basics of Digital Electronics	7	CO1
2.	Combinational Logic circuits	10	CO2
3.	Sequential Logic Circuits	15	CO3
4	8051 Microcontroller	12	CO4
5.	8051 instruction set and programming	16	CO5
	Total	60	

COURSE OBJECTIVES	i)To introduce students to the basic theory of digital electronics, their practical applications.
	ii) To familiarize students to the principle of operation, design and synthesis of different digital electronic circuits.
	iii) To provide strong foundation for further study of digital electronic circuits and systems
	iv) To maintain the microcontrollers used in different applications.

COURSE OUTCOMES	**CO1**	EE505.1	Explain number systems, Logic expressions, Logic gates and Logic families.
	CO2	EE505.2	Analyzecombinational logic circuits.
	CO3	EE505.3	Describe different sequential circuits and memories.
	CO4	EE505.4	Describe the Architecture of 8051 mocro controllers.
	CO5	EE505.5	Analyse 8051 programming for arithmetic and logical operations.

LEARNING OUTCOMES

1.0 BASICS OF DIGITAL ELECTRONICS

1.1 Explain Binary, Octal, Hexadecimal number systems and compare them with Decimal system.
1.2 Perform binary addition, subtraction, Multiplication and Division.
1.3 Write 1‘s complement and 2‘s complement numbers for a given binary number
1.4 Perform subtraction of binary numbers in 2‘s complement method.
1.5 Explain the use of weighted and Un-weighted codes & write Binary equivalent number for a number in 8421, Excess-3 and Gray Code and vice-versa.
1.6 Explain the importance of parity Bit.
1.7 State different postulates and De-Morgan‘s theorems in Boolean algebra.
1.8 Explain AND, OR, NOT, NAND, NOR and EX-OR gates with truth table.
1.9 Realize AND, OR, NOT operations using NAND, NOR gates.
1.10 Classify digital logic families.
1.11 Explain the characteristics of digital ICs such as logic levels, propagation delay, Noise margin, Fan-in, Fan-out, and Power dissipation.
1.12 Draw and explain TTL NAND gate with open collector and Totem pole output.
1.13 Compare the TTL, CMOS and ECL logic families.
1.14 Give IC numbers of two input Digital IC Logic gates.

2.0 COMBINATIONAL LOGIC CIRCUITS

2.1 Give the concept of combinational logic circuits.
2.2 Draw the Half adder circuit and verify its functionality using truth table.
2.3 Realize a Half-adder using NAND gates only and NOR gates only.
2.4 Draw the full adder circuit and explain its operation with truth table.
2.5 Realize full-adder using two Half-adders and an OR – gate and write truth table
2.6 Draw and explain a 4 Bit parallel adder using full – adders.
2.7 Draw and Explain 2‘s compliment parallel adder/ subtractor circuit.
2.8 Explain the working of a serial adder with a Block diagram.
2.9 Compare the performance of serial and parallel adder.
2.10 Draw and explain the operation of 4 X 1 Multiplexers
2.11 Draw and explain the operation of 1 to 4 demultiplexer.
2.12 Draw and explain 3 X 8 decoder.
2.13 Draw and explain BCD to decimal decoder.
2.14 List any three applications of multiplexers and decoders.
2.15 Draw and explain One bit digital comparator.

3.0 SEQUENTIAL LOGIC CIRCUITS

3.1 Give the idea of Sequential logic circuits.
3.2 Explain NAND and NOR latches with truth tables
3.3 State the necessity of clock and give the concept of level clocking and edge triggering,
3.4 Draw and explain clocked SR flip flop with preset and clear inputs.
3.5 Construct level clocked JK flip flop using S-R flip-flop and explain with truth table
3.6 Explain race around condition and explain master slave JK flip flop.
3.7 Write the truth tables of edge triggered D and T flip flops and draw their symbols.
3.8 List the applications of flip flops.
3.9 Define modulus of a counter
3.10 Explain with block diagrams and timing diagrams
(i) 4-bit asynchronous counter , (ii) asynchronous decade counter,
(iii) 4-bit synchronous counter.
3.11 Distinguish between synchronous and asynchronous counters.

3.12 State the need for a Register and list the types of registers.
3.13 Draw and explain the working of
(i) 4 bit shift left and shift right registers, (ii) 4-bit bi-directional shift register
(iii) parallel in parallel out shift register
3.14 Explain the working of ring counter and list its applications
3.15 State memory read operation, write operation, access time, memory capacity, address lines and word length.
3.16 Classify various types of memories based on principle of operation, physical Characteristics, accessing modes and fabrication technology..
3.17 Explain the working of (a) basic diode ROM (b) basic dynamic MOS RAM cell.
3.18 Distinguish between (a) EEPROM and UVEPROM (b) static RAM and dynamic RAM

4.0Micro controller

4.1 Explain the concept of Micro controllers.
4.2 Compare Embedded with External memory devices.
4.3 List the three commonly used Commercial Microcontroller Device families.
4.4 Draw the block diagram of a microcontroller and explain the function of each block.
4.5 Explain the register structure of 8051.
4.6 Explain the functions of various special function registers.
4.7 Draw the pin diagram of 8051 micro controller and specify the purpose of each pin.
4.8 Explain internal memory, external memory and ports of 8051.
4.9 Explain counters & timers in 8051
4.10 Explain serial input / output of 8051
4.11 Explain interrupts in 8051.
4.12 Explain the four timer modes in 8051.

5.0Instruction set and Programming

5.1 State the need for an instruction set.
5.2 Explain the instruction format of 8051.
5.3 Explain fetch cycle, execution cycle and instruction cycle.
5.4 Define the terms machine language, assembly language, and mnemonics.
5.5 Differentiate between machine level and assembly level programming.
5.6 List the major groups in the instruction set along with examples.
5.7 Explain the terms operation code, operand and illustrate these terms by writing an instruction.
5.8 Explain the data manipulation functions data transfer, arithmetic, logic and branching.
5.9 Classify the 8051 instructions into one byte, two byte and three byte instructions.
5.10 Explain the addressing modes of 8051.
5.11 Explain data transfer instructions of 8051.
5.12 Explain the arithmetic instructions and recognize the flags that are set or reset for given data conditions.
5.13 Explain the logic instructions and recognize the flags that are set or reset for given data conditions.
5.14 Explain unconditional and conditional jump and how flags are used to change the sequence of program.
5.15 Write programs of instructions to perform single byte, double byte and multi byte addition and subtraction.
5.16 Illustrate the application of jump instruction in the program.
5.17 Define subroutine and explain its use.
5.18 Explain the sequence of program when subroutine is called and executed.

5.19 Explain how information is exchanged between the program counter and the stack and identify the stack pointer register when a subroutine is called.

5.20 Write program to perform

(i) Single byte & Multi byte addition (ii) Summing-up of given N numbers

(iii) Multiplication of two 8-bit numbers using MUL instruction

(iv) Finding biggest data value in given data array

(v) Conversion of a given HEX number to BCD number

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE505.1	3							3		
EE505.2	3	2	2	2				3	2	
EE505.3	3	2						3		
EE505.4	3							3		
EE505.5	3		2	2	1			3	2	
Average	**3**	**2**	**2**	**2**	**1**			**3**	**2**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note : 1. This Subject is to be taught by Electronics & Communication Engg. faculty

2. Paper setting and paper evaluation is also to be done by Electronics &Communication Engg Faculty.

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

BASICS OF DIGITAL ELECTRONICS

Binary, Octal. Hexadecimal number systems- Binary codes, excess-3 and gray codes- Logic gates : AND, OR, NOT, NAND, NOR, Exclusive-OR-Boolean algebra, Boolean expressions – De-Morgan's Theorems - Characteristics of digital circuits - TTL NAND gate: open collector, totem pole output-CMOS NAND gate, ECL OR/NOR gate , comparison of TTL,CMOS and ECL logic families.

COMBINATIONAL LOGIC CIRCUITS

Implementation of arithmetic circuits, Half adder, Full adder, Serial and parallel Binary adder. Parallel adder/subtractor, Multiplexer, demultiplexer, decoder

SEQUENTIAL LOGIC CIRCUITS

Principle of flip-flops operation, Concept of edge triggering, level triggering, RS, D, JK, T, JK Master Slave flip-flops - Applications of flip flops,. Binary counter- ripple counter, synchronous counter, up-down counter-Shift Registers – ring counter and its applications- Memories-terminology related to memories, RAM, ROM, EEPROM, UVEPROM, static RAM, dynamic RAM

MICRO CONTROLLER

Block diagram of 8051- Pin out diagram of 8051, registers, timers, interrupts, modes of-operation

INSTRUCTION SET AND PROGRAMMING

Instruction set of 8051, instruction format, fetch cycle, execution cycle, instruction cycle, machine cycle, timing diagrams, classification of instructions, addressing modes- Groups of instructions, Opcode, operand - Data transfer, subroutines, single and multi byte addition and subtraction, multiplication, conversion – Assembly level programming.

REFERENCE BOOKS

1. Malvino-Digital Computer Electronics-Tata McGraw-Hill publishers
2.R.P Jain-Modern Digital Electronics-Tata McGraw-Hill publishers
3.Tokheim-Digital Electronics -Tata McGraw-Hill publishers
4. Muhammad Ali Mazidi and Janice GillispeMazidi - 8051 Micro controller and Embedded systems
5.Kenneth J.Ayala. –The 8051 Micro controller-CENAGE LEARNING;3rd edition

BLUE PRINT

S. No	Chapter / Unit Title	No. of periods	Weightage Allocated		Markswise Distribution of Weightage				Questionwise Distribution of Weightage				CO's Mapped
					R	U	Ap	An	R	U	Ap	An	
1	Basics of Digital Electronics	7	14		3	3	8		1	1	1		CO1
2	Combinational Logic circuits	10	14	*	3	3	8	*	1	1	1	*	CO2
3	Sequential Logic Circuits	15	14		3	3	8		1	1	1		CO3
4	8051 Microcontroller	12	14		3	3	8		1	1	1		CO4
5	8051 instruction set and programming	16	14	*	3	3	8	*	1	1	1	*	CO5
	Total	**60**	**70**	**10 ***	**15**	**15**	**40**	**10 ***	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model Papers: Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.18
Unit Test-II	From 4.1 to 5.20

MODEL PAPER – FORMATIVE ASSESMENT-1

C-20-EE-505

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-505 : DIGITAL ELECTRONICS AND MICROCONTROLLERS

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. Answer all five questions.

ii. First question carries four marks and remaining each question carries three marks.

iii. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. (a) Binary equivalent of $(12.34)_8$ _____ .
   (b) One's Complement of $(1010)_2$ _____ .
   (c) Minimum number of Half Adders needed to make a Full Adder are four : True / False
   (d) Flip-Flop is used as _____ . **(CO1)**
2. State De-Morgan's theorems in Boolean algebra. **(CO1)**
3. Realize Half-Adder using NOR gates only. **(CO2)**
4. Compare the performance of Serial Adder and Parallel Adder. **(CO2)**
5. Draw edge triggered D Flip-Flop and write its truth table. **(CO3)**

PART-B **3 X 8 = 24**

Instructions:

i. Answer all three questions.

ii. Each question carries eight marks.

iii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

6. (a) Explain AND, OR, NAND, NOR gates with truth tables. **(CO1)**

   (OR)

   (b) Explain TTL NAND gate with Open Collector and Totem Pole Output, with legible sketch. **(CO1)**

7. (a) Explain the working a 4-Bit Parallel Adder comprised of Full-Adders, with legible sketches. **(CO2)**

   (OR)

   (b) Explain the working of BCD to Decimal Decoder with legible sketches. **(CO2)**

8. (a) Explain the working of asynchronous decade counter with legible sketches. **(CO3)**

   (OR)

   (b) Explain the working of basic Dynamic MOS RAM cell with a sketch. **(CO3)**

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MODEL PAPER – FORMATIVE ASSESMENT-2
C-20-EE-505
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-505 : DIGITAL ELECTRONICS AND MICROCONTROLLERS

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) Ports which can be used as address bus in 8051 microcontroller are _____ .
   (b) 8051 microcontroller performs operations on _____ bit data.
   (c) P3.0 and P3.1 in 8051 microcontroller are used for Serial Communication : True / False
   (d) Opcode for the instruction MOV A, R0 In 8051 microcontroller is _____**(CO4, CO5)**
2. State the need of registers in 8051 microcontroller. **(CO4)**
3. Draw the pin diagram of 8051 microcontroller. **(CO4)**
4. State the need for an instruction set to work with a microcontroller. **(CO5)**
5. List the major groups in the instruction set of 8051 microcontroller. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Explain the Counters available in 8051 microcontroller. **(CO4)**

   (OR)

   (b) Explain the Interrupts available in 8051 microcontroller. **(CO4)**

7. (a) Explain any four Logical Instructions of 8051 microcontroller with examples. **(CO5)**

   (OR)

   (b) Explain any four Conditional Jump Instructions of 8051 microcontroller with examples. **(CO5)**

8. (a) Write an assembly language program to find the biggest number in an array of numbers. **(CO5)**

   (OR)

   (b) Write an assembly language program to find the product of two eight bit numbers.**(CO5)**

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MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-505
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-505 : DIGITAL ELECTRONICS AND MICROCONTROLLERS

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. Convert the following into binary: (a) $(67.89)_{10}$ (b) $(1F)_{16}$ (c) $(23.45)_{8}$. **(CO1)**
2. State De-Morgan's theorems in Boolean algebra. **(CO1)**
3. Realize Half-Adder using NOR gates only. **(CO2)**
4. Compare the performance of Serial Adder and Parallel Adder. **(CO2)**
5. Draw edge triggered D Flip-Flop and write its truth table. **(CO3)**
6. Classify various types of memories based on accessing modes. **(CO3)**
7. State the need of registers in 8051 microcontroller. **(CO4)**
8. Draw the pin diagram of 8051 microcontroller. **(CO4)**
9. State the need for an instruction set to work with a microcontroller. **(CO5)**
10. List the major groups in the instruction set of 8051 microcontroller. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer**.

11. (a) Explain AND, OR, NAND, NOR gates with truth tables. **(CO1)**

(OR)

(b) Explain TTL NAND gate with Open Collector and Totem Pole Output, with legible sketch. **(CO1)**

12. (a) Explain the working a 4-Bit Parallel Adder comprised of Full-Adders, with legible sketches. **(CO2)**

(OR)

(b) Explain the working of BCD to Decimal Decoder with legible sketches. **(CO2)**

13. (a) Explain the working of asynchronous decade counter with legible sketches. **(CO3)**

(OR)

(b) Explain the working of basic Dynamic MOS RAM cell with a sketch. **(CO3)**

14. (a) Explain the Counters available in 8051 microcontroller. **(CO4)**

(OR)

(b) Explain the Interrupts available in 8051 microcontroller. **(CO4)**

15. (a) Explain any four Logical Instructions of 8051 microcontroller with examples.**(CO5)**

(OR)

(b) Explain any four Conditional Jump Instructions of 8051 microcontroller with examples. **(CO5)**

PART-C **1 x 10 = 10**

Instructions:

- **i. This question carries ten marks.**
- **ii. The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

16 Develop an assembly language program to find the biggest number in an array of numbers. **(CO5)**

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ELECTRICAL UTILIZATION AND TRACTION

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-506	ELECTRICAL UTILIZATION AND TRACTION	4	60	20	80

COURSE OUTCOMES MAPPING

S.No	Unit Title	No. of periods	CO's Mapped
1.	Electric Lighting	14	CO1
2.	Electric heating	12	CO2
3.	Energy saving devices	8	CO3
4	Electric Traction – Properties and equipment	20	CO4
5.	Traction supply systems and Train lighting systems	6	CO5
	Total	**60**	

COURSE OBJECTIVES	i) Able to maintain / Trouble shoot various lamps and fittings in use.
	ii) Makes to identify a heating scheme for a given application.
	iii) Helps in understanding the different schemes of traction schemes, its main components and motors

COURSE OUTCOMES	CO1	EE-506.1		Design lighting schemes for a given application.
	CO2	EE-506.2		Comparedifferent types of electrical heating techniques.
	CO3	EE-506.3		Draw the automatic temperature and illumination control circuits for various power saving devices.
	CO4	EE-506.4		Analyze electric traciton equipment and overhead equipment.
	CO5	EE-506.5		Describe operat ion of train lighting system.

LEARNING OUTCOMES

Electric Lighting

1.1 Explain the nature of light and of itspropagation

1.2 Define

(i) Plane and solid angles (ii) nous flux Lumen
(iii) Luminous intensity (iv) mination
(v) Candle power (vi) Polar curve
(vii) Brightness (viii)
(ix) MHCP (x) MSCP
(xi) MHSCP (xii) wave length
(xiii) Glare

1.3 Explain the production of lightby

(i) Excitation(ii)Ionisation (iii)Fluorescence andphosphorescence

1.4 List the types of lamps used for illumination for different situations suchas

(i) Domestic(ii) Industrial(iii) Decoration (iv) Advertisement (v)Street lightingschemes

1.5 State the requirements of goodlighting

1.6 List the lamp fittings used in domestic and Industrialapplications

1.7 Draw different lampfittings

1.8 State the uses and advantages of each type of Lampfittings.

1.9 State and explain the laws ofillumination.

1.10 Solve Problems onIllumination

1.11 Define theterms:

(i) Utilisation factor (ii)Depreciationfactor (iii) Waste lightfactor

(iv)Reflectionfactor (v)Reductionfactor(vi) Absorptionfactor

(vii) Luminous efficiency (viii) Specificenergyconsumption (ix)Space-height ratio

1.12 Design a simple lighting scheme for drawinghall

Electric Heating

2.1 State the advantages of electricheating

2.2 List the requirements of good heatingmaterial and state the materials employed for heating

2.3 Explain with legiblesketch

(i) Directresistanceheating (ii) Indirect resistanceheating

2.4 State the industrial applicationof

(i) Directresistanceheating (ii) Indirect resistanceheating

2.5 Explain the different methods of temperature controls with legiblesketch

2.6 Explain the different types of electric arc furnaces with legiblesketch:

(i) Direct arcfurnace (ii) Indirect arcfurnace

2.7 Explain the basic circuit for electric arc furnace showing the arrangement ofOCB Control panels, CTs through relays, furnace transformer and arrangement of electrode movement

2.8 State the application of direct and indirect arc furnaces inindustry

2.9 Explain the principle of operations of induction furnaces with legible sketches (low and high frequency, core type and core lesstype)

2.10 List the industrial application of the followingFurnaces.

(i) coretype ii)coreless type iii)high frequencytype

2.11 State the principle of dielectricheating and list the industrial applications of the dielectricheating

Energy saving Devices

3.1 State the need of power savingdevices.

3.2 Draw Automatic temperature control circuits for (coolers, geysers, air conditioners, and ironboxes)

3.3 DrawAutomaticilluminationcontrolcircuitsusingLDR's.

3.4 List the advantages of CFLamps.

3.5 List the advantages of LED lamps over other types oflamps.

3.6 Compare CF lamps with tungsten filamentlamps.

Electric Traction - Properties and equipment

4.1 Describe different methods of trackelectrification.

4.2 List the types of traction services and sketch the speed-time curves,

4.3 State each stage of the speed-time curve with appropriatespeeds.

4.4 Define Maximum speed, average speed and scheduledspeed

4.5 List the factors affecting the scheduledspeed

4.6 Sketch the simplified speed-time curves and state their practicalimportance

4.7 Derive the expression for

(i)maximum speed (ii) acceleration and retardationfor

(a) Trapezoidal speed time curve(b)Quadrilateral speed timecurve.

And solve problems

4.8 Explain the tractiveeffort

4.9 Derive the expression for tractive effort for acceleration to overcome gravity pull and train resistance and solve problems.

4.10 Explain the mechanics of transfer of power from motor to drivingwheel

4.11 Define `Coefficient ofadhesion' and list the factors affecting the coefficient ofadhesion

4.12 Solve problems on calculation of number of axelsrequired.

4.13 State the methods of improving the coefficient ofadhesion

4.14 Define specific energyconsumption and list the factors affecting it.

4.15 Derive the formulae for energy output of driveto

(i) Accelerate (ii)To overcomefriction (iii) To overcomegradient and solve problems.

4.16 List the various Overhead Equipments (OHE) inTraction.

4.17 State the Principles of Design of OHElike

(i) Composition ofOHE. (ii) Height of ContactWire.

(iii) Contact WireGradient. (iv) Encumbrances.(v) SpanLength.

4.18 State the important requirements of tractionmotor

4.19 Explain the suitability of different motors D.C,1-Ø A.C, 3-Ø A.C. ,Composite & Kando systems fortraction

4.20 State the need for BoosterTransformer.

Traction supply systems and Train lighting systems

5.1 Describe the Major Equipment at tractionSubstation.

(i) Transformer. (ii) CircuitBreaker. (iii) Interrupter.

5.2 State the importance of Location and Spacing ofSubstations.

5.3 Explain End onGeneration.

5.4 Explain Mid onGeneration

5.5 State the requirements of Trainlighting.

5.6 Mention the requirements of railway coach airconditioning.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-506.1	3	1	1					3		
EE-506.2	3							3		
EE-506.3	3							3		
EE-506.4	3		1	1.5				3	1	
EE-506.5	3	1		1	1			3	1	
Average	**3**	**1**	**1**	**1.25**	**1**			**3**	**1**	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Electric Lighting
Nature of light and its production, electromagnetic spectrum - units of wave length - Terms and definitions plane and solid angle, luminous flux, Lumen, C.P, glare, Illumination, brightness, polar curve, MHCP, MSCP, MHSCP, Principle of production of light by excitation, ionisation, fluorescence and phosphorescence - types of lamps - Requirements of good lighting different types of lamp fittings laws of illumination. Terms and factors used in design of lighting schemes for indoor, factory, outdoor and street lighting schemes –problems

Electric Heating
Advantages of electric heating - requirements of good heating material and materials generally employed, direct resistance heating - principle and application-Indirect resistance heating - Principle and applications - Temperature control of resistance furnaces - Electric arc furnaces - direct and indirect types - applications - Induction heating core type furnace – Ajax Wyatt Vertical core furnace - coreless type furnace - Applications - Dielectric heating - principle advantages and applications.

Energy saving Devices
Need of power saving devices.- Automatic temperature control circuits- Automatic illumination control circuits using LDR's- Advantages of CF Lamps- Advantages of LED lamps over other types of lamps- Compare CF lamps with tungsten filament lamps

Electric Traction - properties and equipment
Single-phase A.C. and Composite systems -Types of services (main line, suburban , Metro and urban) - speed-time curves for the above services- importance of speed-time curves - Maximum speed, average speed and scheduled speed- Factors affecting the scheduled speed - Simplified speed-time curves & practical importance -Expression for maximum speed, acceleration and retardation for Trapezoidal & Quadrilateral speed time curves.- numerical examples - tractive effort & derivation - Coefficient of adhesion-factors affecting the coefficient of adhesion -

problems on calculation of number of axles required - methods of improving the coefficient of adhesion- specific energy consumption- factors affecting specific energy consumption-simple problems on specific energy calculation under given conditions. Overhead Equipments (OHE) - State the important requirements of traction motor - suitability of different motors D.C, 1-Ø A.C,3-Ø A.C., Composite & Kando systems for traction - NeedofBoosterTransformer.

Traction supply systems and Train lighting systems

Major Equipment at traction Substation - Location and Spacing of Substations - End on Generation- Mid on Generation-Requirements of Train lighting - requirements of railway coach air conditioning.

REFERENCE BOOKS

1. J B Gupta – Utilisation of Electric Power and Electric Traction-KATSON BOOKS
2. R.K.Gang - Utilisation ofElectricenergy
3. H.Partab -Art and Science ofelectricpower-Dhanpat Rai and Co.
4. K.B.Bhatia - Study of Electrical Appliancesanddevices-Khanna publishers
5. G.C.Garg-Utilization Electric Power and Electric Traction-Khanna publishers
6. R.K.Rajput-Utilization Electric Power-Parag enterprises

BLUE PRINT

S.No	Unit / Unit Title	No. of periods	Weightage Allocated		Markswise Distribution of Weightage				Questionwise Distribution of Weightage				CO's Mapped
					R	U	Ap	An	R	U	Ap	An	
1	Electric Lighting	14	14	*	3	3	8	*	1	1	1	*	CO1
2	Electric heating	12	14	*	3	3	8	*	1	1	1	*	CO2
3	Energy saving devices	8	10		3	3	4		1	1	1/2		CO3
4	Electric Traction – Properties and equipment	20	22	*	3	3	16	*	1	1	2	*	CO4
5	Traction supply systems and Train lighting systems	6	10		3	3	4		1	1	1/2		CO5
	Total	**60**	**70**	**10***	**15**	**15**	**40**	**10***	**5**	**5**	**5**	**1**	

Note: Part C: Ten marks single analytical question may be given from chapters marked with *.

Model Papers: Syllabus to be Covered for Unit Tests

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From 1.1 to 3.3
Unit Test-II	From 3.4 to 5.6

MODEL PAPER – FORMATIVE ASSESMENT-1
C-20-EE-506
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-506 : ELECTRICAL UTILIZATION AND TRACTION

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. (a) The unit for illumination is _____.
   (b) The full form of MSCP related to electric lighting is _____.
   (c) The nichrome is one of the heating material used in electric heating furnaces. (True/False).
   (d) State any one power consuming device in a domestic. **(CO1,CO2,CO3)**
2. Define (i) Lumen (ii() Utilisation factor. **(CO1)**
3. State any three advantages of electric heating. **(CO2)**
4. State the need for power saving devices. **(CO3)**
5. State any three requirements of good lighting. **(CO1)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) Two lamps A and B of 200 candela and 400 candela respectively are situated 100 m apart. The height of A above the ground level is 10 m and that of B is 20 m. Calculate the illumination at the centre of the line joining the two lamp posts. **(CO1)**

(OR)

(b)An illumination of 95 lux is required on working plane in a big hall of (26m x 30m). The lamps to be hung 5m above the work bench. The utilisation factor is 0.5 and lamp efficiency of 14 lumens per watt and candle power depreciation of 18%. Assuming suitable space height ratio, estimate the rating and disposition of lamps. **(CO1)**

7. (a) Explain indirect resistance heating with legible sketch. **(CO2)**

(OR)

(b) Explain direct arc furnace with legible sketch. **(CO2)**

8. (a) Draw automatic temperature control circuit for geyser. **(CO3)**

(OR)

(b) Draw automatic illumination control circuit using LDR's. **(CO3)**

***

UNIT TEST II - MODEL PAPER – FORMATIVE ASSESMENT-2

C-20-EE-506

BOARD DIPLOMA EXAMINATION, (C-20)

DEEE – FIFTH SEMESTER EXAMINATION

EE-506 : ELECTRICAL UTILIZATION AND TRACTION

Time: 90 Minutes Total Marks: 40

PART-A **(1 x 4) + (4 x 3) = 16**

Instructions:

i. **Answer all five questions.**
ii. **First question carries four marks and remaining each question carries three marks.**
iii. **Answers should be** brief and straight to the point and shall not exceed five simple sentences

1. (a) The abbreviation for LED in LED lamps is _____.

   (b) The first stage of speed-time curve is _____.

   (c) The droppers are the one of the overhead equipment in electric traction system. True / False.

   (d) The supply used for lighting purpose in electric trains is ____ . **(CO3,CO4,CO5)**

2. List the any three advantages of LED lamps over other types oflamps. **(CO3)**

3. List the factors affecting the scheduledspeed. **(CO4)**

4. List the various Overhead Equipments (OHE) in Electric Traction. **(CO4)**

5. State the purpose of Transformer and circuit breaker in electric traction. **(CO5)**

PART-B **3 X 8 = 24**

Instructions:

i. **Answer all three questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

6. (a) An electric train has an average speed of 42 kmph on a level track between stops 1,400 m apart. It is accelerated at 1.7 kmphps and is braked at 3.3 kmphps. Draw the speedtime curve for the run. **(CO4)**

(or)

(b) A train is required to run between two stations 1.6 km a part at an average speed of 40 kmph. The run is to be made to a simplified quadrilateral speed-time curve. If the maximum speed is to be limited to 64 kmph, acceleration to 2.0 kmphps and coasting and braking retardation to 0.16 kmphps and 3.2 kmphps, respectively, determine the duration of acceleration, coasting and braking periods. **(CO4)**

7. (a) A 200 tonne motor coach having 4 motors each developing 6,000 Nm torque during acceleration, starts from rest. If the gradient is 30 in 1,000, gear ratio 4; gear transmission efficiency 90%; wheel radius 45 cm; train resistance 50 N/tonne; addition of rotational inertia 10%. Calculate the time taken to attain a speed of 50 kmph. If the line voltage is 3,000 V dc and efficiency of motors 85%, find the current during notching period.**(CO4)**

(or)

(b) An electric locomotive is required to haul a train of 12 coaches, each weighing 30 tonnes on the main line service requiring an initial acceleration of 0.8 kmphps up a gradient of 1 in 100. Estimate the adhesive weight and hence the number of drivingaxles the locomotive must have if the permissible axle loading is 20 tonnes per axle assuming rotational inertia to be 4% for the coaches and 15% for the locomotive. Maximum coefficient of adhesion is 0.2 and the tractive resistance 5 kg/tonne. **(CO4)**

8. (a) Explain End onGeneration with legible sketch. **(CO5)**

(or)

(b) Explain Mid onGeneration with legible sketch. **(CO5)**

***

MODEL PAPER – SUMMATIVE EXAMINATION
C-20-EE-506
BOARD DIPLOMA EXAMINATION, (C-20)
DEEE – FIFTH SEMESTER EXAMINATION
EE-506 : ELECTRICAL UTILIZATION AND TRACTION

Time: 3 hours Total Marks: 80

PART-A **10 X 3 = 30**

Instructions:

i. **Answer all questions.**
ii. **Each question carries three marks.**
iii. **Answers should be brief and straight to the point and shall not exceed five simple sentences**

1. Define the terms related to electric lighting (i) Lumen (ii) Utilisation factor. **(CO1)**
2. State any three requirements of good lighting. **(CO1)**
3. State any three advantages of electric heating. **(CO2)**
4. List any six industrial applications of dielectric heating. **(CO2)**
5. State the need of power saving devices. **(CO3)**
6. List any six advantages of LED lamps over other types of lamps. **(CO3)**
7. Define (i) Maximum speed (ii) Average speed related to traction. **(CO4)**
8. State the need for booster transformer in electric traction. **(CO4)**
9. State any six major equipments in traction sub-station. **(CO5)**
10. State the requirements of train lighting. **(CO5)**

PART-B **5 X 8 = 40**

Instructions:

i. **Answer all five questions.**
ii. **Each question carries eight marks.**
iii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.**

11. (a) Two lamps luminous intensity 150 candela and 200 candela are mounted at 10m and 15m respectively. The horizontal distance between the lamp posts is 30m. Calculate the illumination in the middle of the post. Explainsurface PVC conduit wiring with legible sketches. **(CO1)**

(OR)

(b) A drawing hall 30 m ×15 m with ceiling height of 5 m is to be provided with a general illumination of 120 lux. Taking the coefficient of utilisation of 0.5 and depreciation factor of 1.4, determine the number of fluorescent tubes required, their spacing, mounting height and total wattage. Take luminous efficiency of fluorescent tube as 40 lumen/watt for 89 watt tube. **(CO1)**

12. (a) Explain direct resistance heating with legible sketch. **(CO2)**

(OR)

(b) Explain the principle of operation of core type induction furnace with legible sketch. **(CO2)**

13. (a) (i) Draw automatic illumination control circuit using LDR's. **(CO3)**

(ii)Explain the importance of location and spacing of substations in electric traction system. **(CO5)**

(OR)

(b) (i) Draw automatic temperature control circuit for air conditioner. **(CO3)**

(ii) Explain Mid-on generation in electric traction. **(CO5)**

14. (a) The average speed of an electric train is 45 kmph and distance between two stops is 2.1km. The acceleration, coasting and braking retardations are 2.5 kmphps, 0.15 kmphps and 3 kmphps respectively. Find the distance covered during each period. **(CO4)**

(OR)

(b) Derive an expression for maximum speed, acceleration and retardation for Trapezoidal speed-time curve. **(CO4)**

15. (a) An electric train weighing 200 tonnes has 8 motors geared to driving wheels. Each wheel is 90 cm diameter. Determine the torquedeveloped by each motor to accelerate the train to a speed of 48 kmph in 30 sec. Up a gradient of 1 in 200. The tractive resistance is of 50 N/tonne, the effect of rotational inertia is 10% of the train weight, the gear ratio is 4 to 1 and gearing efficiency 80%. **(CO4)**

(OR)

(b) An electric train weighing 200 tonne has a rotational inertia of 12%.The train runs between two stations which are 3 km apart. It has an average speed of 45 kmph. The acceleration and braking retardations are 1.5 kmphps and 2.5 kmphps respectively. The percentage up gradient is 2%. The track resistance and overall efficiency are 50 N/tonne and 85% respectively. Determine Specific Energy Consumption. **(CO4)**

PART-C **1 x 10 = 10**

Instructions:

i. **This question carries ten marks.**

ii. **The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer**.

16. What must be the maximum spacing between the lamps so that illumination on the ground midway between the lamps at least half of the illumination directly under the lamp .**(CO1)**

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ELECTRICAL MACHINES – III LABORATORY

Course code	Course title	No.of periods/week	Total no. of periods	Marks for FA	Marks for SA
EE-507	ELECTRICAL MACHINES – III LABORATORY	3	45	40	60

S.No.	Unit Title	No.of Periods	CO'S Mapped
1	Tests on 1-phase and 3-phase AC Motors	21	**CO1**
2	Drawing circle diagram on AC Motors	12	**CO2**
3	Identify and rectify faults in AC motors and starters	12	**CO3**
Total Periods		**45**	

Course Objectives:

Course Objectives	(i)To operate single phase and three phase A.C. Motors and analyse their performance (ii)To conduct tests and estimate the parameters of three phase induction motors and predict theperformance (iii)To identify different parts of A.C motors and starters, and Troubleshoot if foundfaulty.

Course outcomes:

Course outcomes	**CO1**	EE-507.1	Conduct load test on a single phase and three phase induction motors to draw performance characteristics.
	CO2	EE-507.2	Conduct suitable test on three phase induction motors to daw circle diagram for analysing theri performance.
	CO3	EE-507.3	Identify various faults in A.C motors.AC starters and troubleshoot for rectifying faults.

Learning outcomes:

Tests on 1-phase and 3-phase ACMotors

i. Conduct brake test on 3-phase squirrel cage inductionmotor.
ii. Conduct Brake test on 3-phase slip ring inductionmotor.
iii. Conduct load test on synchronous motor and draw V and inverted Vcurves
iv. Perform Load test on Single phase split type inductionmotor.
v. Perform Load test on single phase capacitor type inductionmotor
vi. Perform Load test on a single phase Universalmotor

Drawing circle diagram on ACMotors

I. Conduct suitable tests and draw circle diagram of squirrel cage inductionmotor.
II. Conduct suitable tests and draw circle diagram of slip ring inductionmotor.

Identify and rectify faults in AC motors andstarters

III. Identify and rectify faults in ACmotors.
IV. Identify and rectify faults in ACstarters

Competencies & Key competencies to be achieved by the student

S.No	Experiment Title	Competencies	Key competency
1	Brake test on 3-phase squirrel cage induction motor.	▪ Draw the circuitdiagram ▪ Identify the different terminals of 3-ph induction motor ▪ Select the suitablestarter. ▪ Identify the terminals of thestarter. ▪ Select the range and type of themeters ▪ Make the connections as per the circuitdiagram ▪ Start the motor using a starter Apply the load up to full load insteps ▪ Pour water in the brakedrum ▪ Note down the readings of ammeter and voltmeter for eachload. ▪ Calculate the output, torque and efficiencyetc ▪ Plot the performancecharacteristics ▪ Verify the performance of themachine.	▪ Apply the load up to full load in steps ▪ Pour water in the brake drum ▪ Before Switching off the motor remove the load
2	Brake test on 3-phase slip ring induction motor.	▪ Draw the circuitdiagram ▪ Interpret the name platedetails ▪ Identify the different terminals of the 3-ph induction motor ▪ Select the suitablestarter. ▪ Identify the terminals of thestarter. ▪ Select the range and type of themeters ▪ Make the connections as per the circuitdiagram ▪ Start the motor using astarter	▪ Before giving supply Slip rings must be short circuited ▪ Speed shouldbe ▪ measured

		▪ Verify the performance of themachine.	accurately
3,4	Load test on a) split phase induction motor. b) capacit or type induction motor	▪ Draw the circuitdiagram ▪ Identify the different terminals of the 1-ph split phase induction motor /1-ph capacitor type induction motor and thestarter ▪ Select the ranges and type of themeters ▪ Make the connections as per circuitdiagram ▪ Start the motor using astarter ▪ Apply the load in steps ▪ Record the meterreadings ▪ Verify the performance of themachine.	▪ Start the motor using a ▪ starter without load ▪ Apply the load up to full load in steps
5	Load test on single-phase Universal motor.	▪ Draw the circuitdiagram ▪ Identify the different terminals of the 1-ph universal motor ▪ Select the range and type of themeters ▪ Make the connections as per the circuitdiagram ▪ Start the motor using astarter ▪ Apply the brake load lightly ▪ Verify the performance of themachine	▪ Apply the brake load lightly ▪ Take the readings properly
6,7	Conduct suitable tests and draw circle diagram of a)squirrel cage induction motor b)slip ring induction motor	▪ Draw the circuit diagram for No-load test and Blocked rotortest ▪ Make the connections for no-load test and Blocked rotor test as per the circuitdiagram ▪ Start the motor withoutload ▪ Apply the rated voltage to the motor in the no-load test and rated current to the blocked rotortest. ▪ During the Blocked rotor test fully tighten the rotor shaft ▪ Record the meterreadings ▪ Calculate the output, torque ,efficiencyetc. ▪ Plot the performancecharacteristics. ▪ Verify the performance of themachine. ▪ Draw the circle diagram on a graph sheet using the test data ▪ Select proper scale to draw the circlediagram	▪ Apply the rated voltage to the motor in the no-load test ▪ and rated current to the blocked rotor test. ▪ During the Blocked rotor test fully tighten the rotor

8	Conduct load test on synchronous motor and draw V and inverted V curves	▪ Draw the circuitdiagram ▪ Identify different terminals of the 3-ph synchronous motor ▪ Select the range and type of themeters ▪ Make the connections as per thecircuit ▪ Start the motor as per theprocedure ▪ Switch on the excitation at correcttime ▪ Vary the excitation insteps ▪ Pour water in the brake drum forcooling. ▪ Reduce the load to zerogradually. ▪ Switch off themotor. ▪ Disconnect thecircuit. ▪ Calculate the output, torque ,efficiencyetc. ▪ Plot the performancecharacteristics. ▪ First switch off the excitation and then only switch off themains ▪ Draw the V and inverted V curves on a single graph sheet	▪ Switch on the excitation at correct time ▪ Vary the excitation insteps ▪ First switch off the excitation and then onlyswitch ▪ off mains
9	Identify and rectify faults in AC motors	▪ Select a faultymotor ▪ Identify the different terminals of acmotors. ▪ Interpret the name platedetails. ▪ Identify the different parts of the motorIdentify the ▪ problems in the motor by physical observation ▪ Verify all the connections of the motor andthe ▪ starter ▪ Check for burnoutfuses. ▪ Identify any loose connections if any totighten the ▪ connections ▪ Check the condition ofbearings. ▪ Check the continuity of different windings byusing ▪ DMM or Test lamp. ▪ Identify any open or short circuits in thewindings. ▪ Checkthecontinuitybetweenwindingsandbody ▪ earthing. ▪ Start the motor using a starter withoutload. ▪ Observe whether the motor is running ornot ▪ If running with normal speed no problem inthe ▪ motor. ▪ If running with low speed check for reversal ofphase ▪ and Reduce the load to Zero gradually ▪ Switch off themotor ▪ Disconnect thecircuit.	▪ Identify the problems in motor by physical ▪ observatio ▪ n ▪ ▪ check for reversalof ▪ phase and Reduce the load to ▪ Zero gradually ,If ▪ the Motor ▪ is running with low speed

10	Identify and rectify faults in AC starters	▪ Check the input and output terminals of thestarter ▪ Check the condition of contactors for opening and closing ▪ Check for open circuit and short circuit in the coils of contactor. ▪ Check the condition of over load relay coil and no voltcoil ▪ Check the current setting dial for proper current setting ▪ Check the contactor opening and closingtime.	▪ Check the current setting dial for proper current setting

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-507.1	3	1						3		
EE-507.2	3	1						3		
EE-507.3	3	1						3		
Average	3	1	1		1			3	1	

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

Hyponated Course Contents:

Test on single phase and three phase A.C.Motors.

Load test on – split-phase induction motor, single phase capacitor start induction motor- universal motor and three phase synchronous motor- calculate efficiency and plot Torque speed characteristics- Brake test on three phase squirrel cage induction motor and slip ring induction motor, calculate the efficiency and plot the torque slip characteristics**.** Draw the v curves and inverted v curves**.**

Drawing Circle Diagram on A.Cmotors.

No-load test and blocked rotor test on squirrel cage and slip ring induction motor, calculate output power, Torque, Efficiency, calculate the machine parameters, Draw the circle diagram, estimate the performance and verify the performance.

Identify and rectify faults in AC motors andstarters

Identification of parts of motor and physical observation- proper connections- burnouts- loose connections- phase reversal- bearings- continuity test(test lamp & DMM)- insulation resistance test- starters – O.C and S.C test on relay contactor- condition for overload relay – proper current setting of starters

Life Skills

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
EE-508	Life Skills	3	45	40	60

S. No.	Unit Title	No of Periods	COs Mapped
1	Attitude	4	CO1
2	Adaptability	4	CO1, CO2
3	Goal Setting	4	CO1, CO2, CO3
4	Motivation	4	CO1, CO2, CO3
5	Time Management	4	CO2
6	Critical thinking	4	CO3
7	Creativity	4	CO3
8	Problem Solving	5	CO3
9	Team Work	4	CO4
10	Leadership	4	CO4
11	Stress Management	4	CO4
Total Periods		**45**	

Course Objectives	To understand the importance of Life skills for acceptable, sustainable and ethical behaviour in academic, professional and social settings
	To exhibit language competence appropriate to acceptable social and professional behaviour.
	To demonstrate time management, stress management, team skills, problem solving ability to manage oneself in academic, professional and social settings.

CO No.	Course Outcomes
CO1	Demonstrates positive attitude and be able to adapt to people and events
CO2	Fixes personal and professional goals and manages time to meet targets
CO3	Exhibits critical and lateral thinking skills for problem solving.
CO4	Shows aptitude for working in teams in a stress free manner and sometimes/ very often/ mostly display leadership traits.

CO-PO Matrix

Course Code EE-508	**Course Title: English Number of Course Outcomes: 4**				**No. of Periods: 45**
POs	Mapped with CO No.	CO Periods Addressing PO in Column 1		Level of Mapping (1,2,3)	Remarks
		Number	Percentage %		
PO1		Not directly applicable for Life Skills Course. However activities that use content and situations from academic, professional and social settings relevant to the Programme shall be exploited for triggering thought and interaction in the Course.			
PO2					
PO3					
PO4					
PO5	CO1, CO2, CO3, CO 4	11	25%		>60%: Level 3 16 -59%: Level 2 Up to 15%: Level 1
PO6	CO1, CO2, CO3, CO4	27	45%		
PO7	CO1, CO2, CO3, CO4	7	30%		

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

Mapping Course Outcomes with Program Outcomes:

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO 1					✓	✓	✓
CO 2					✓	✓	✓
CO3					✓	✓	✓
CO4					✓	✓	✓

Blue Print for evaluation based on Course Outcomes for SA:
Note: Every Activity based Question that focuses on COs and responses as exhibited through communication has to be given marks for the following parameters

- Clarity of Thinking as Exhibited through Content
- Features of Etiquette

***Rubric Descriptors 'Outstanding/ Very Good/ Good/ Satisfactory/ Poor' levels of Competence**

Level of Competence	Parameters of Assessment	
	Clarity of thinking as exhibited through content	**Features of etiquette**
Outstanding 10	**Thinking** is **extremely logical** and suggested course of action is **feasibile** Shows **creativity and uniqueness** Exhibits **expert use of expression** (organizational devices and discourse markers) that denote clarity in thought.	Exhibits **courtesy to all most appropriately** with **confidence**
Very Good 8/9	**Thinking** is **clear and logical** Suggested **course of action is feasible** Shows **traces of creativity** Exhibits **good expression** (organizational devices and discourse markers) that denote clarity in thought.	Exhibits **courtesy to all to a considerable level.**
Good 6/7	**Thinking is clear and logical most of the time**. Lacks creativity or out of the box thinking as expressed through content.	Exhibits **courtesy / politeness to an acceptable level.**
Satisfactory 4/5	**Thinking is logical**; However **expressing content is disjointed and disorganized.**	Has courtesy but often fumbles with language.
Poor 3 or less than 3	**Thoughts** as expressed through content are **incoherent.Language skills are very limited.**	Fails to show courtesy to others.

Blue Print for evaluation based on Course Outcomes for SA of each student:
Note: Marks are awarded for each student as per the Rubric descriptors.

S No.	Questions based on Course Outcomes	Periods Allocated for practical work	Max Marks	Poor >3	Satisfactory 4 /5	Good 6/7	Very Good 8/9	Outstanding 10
1	Short presentation on GOALS with Timeline and Action Plan	12	10					
2	State what you will do in the given situation (Assesses adaptability and critical thinking skills, leadership, team skills)	12	10					
3	In how many different and creative way can you use _____ (Object) other than its primary use	8	10					
4	What solutions can you think of for _____ problem.	13	10					
	Total	**45**	**60**					

Note: The marks that are awarded for the student for 40 to be increased proportionally for 60.

Learning Outcomes

1. **Attitude Matters :**
   - 1.1 Understand the importance of positive attitude and the consequences of negative attitude.
   - 1.2 Demonstrate positive attitude in dealing with work-related issues and in personal life.
2. **Adaptability….makes life easy :**
   - 2.1 Understand the significance of adaptability.
   - 2.2 Show adaptability whenever needed, both at place of work and on personal front.
3. **Goal Setting … life without a Goal is a rudderless boat!**
   - 3.2 Understand the SMART features of goal-setting.
   - **3.3** State one's short-term and long-term goals and spell out plans to achieve them.
4. **Motivation … triggers success!**
   - 4.2 Comprehend the need for motivation in order to achieve success in life.
   - 4.3 State how one is motivated in life.
   - 4.4 Show the impact of motivation on one's life.
5. **Time Management… the need of the Hour!**
   - 5.2 Understand the value of time management and prioritizing in life
   - 5.3 Demonstrate the effect of time management on one's professional work.

6. Critical Thinking … logic is the key!

6.1 Distinguish between facts and assumptions

6.2 Use logical thinking in dealing with professional matters

7. Creativity … the essential you!

7.2 Understand the importance of thinking out of the box in dealing with critical issues

7.3 Solve problems using creativity / imagination

8. Problem Solving … there is always a way out!

8.2 Understand the need for and importance of problem solving.

8.3 Use logic or creativity to solve a problem at workplace or home.

9. Team Work… together we are better!

9.1 Understand the need for team skills / team building

9.2 Demonstrate one's skills as a team player

10. Leadership… the meaning of a leading!

10.1 Understand the need for team skills / team building

10.2 Demonstrate one's skills as a team player

11. Stress Management… live life to the full!

11.1 Understand what causes stress and how to cope with stress at workplace.

11.2 Demonstrate how stress can be overcome in a healthy way.

PLC LAB

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-509 A	PLC LAB	3	45	20	30

COURSE OUTCOMES MAPPING

S.No	Unit Title	No. of periods	CO's Mapped
1.	Basics of PLC	9	CO1
2.	Ladder Diagrams for logic gates, timers and counters	9	CO2
3.	Ladder Diagrams for domestic applications	12	CO3
4.	Ladder Diagrams for industrial applications	15	CO4
	Total	**45**	

COURSE OBJECTIVES	i) To provide knowledge levels needed for PLC programming and operating.
	ii) To train the students to create ladder diagrams from process controldescriptions.
	iii) Apply PLC Timers and Counters for the control of industrial processes and to train the students to develop a coil and contact control to operate analog PLC operations.

COURSE OUTCOMES	CO1	EE-509A.1	Analyse PLC software to prepare ladder diagram.
	CO2	EE-509A.2	Construct ladder diagrams for logic gates using timers and counters.
	CO3	EE-509A.3	Execute automated ladder diagrams for different domestic applications.
	CO4	EE-509A.4	Design automated ladder diagrams for various industrial applications.

LEARNING OUTCOMES

Basics of PLC

i) Demonstrate PLCarchitecture

ii) Working with various tools available in PLCsoftware

iii) Preparation of ladder diagram, uploading of code to PLC and running the code onPLC

Ladder Diagrams for logic gates, timers and counters

iv) Execute ladder diagram for different LogicalGates

v) Execute ladder diagram using timers &counters

Ladder Diagrams for domestic applications

vi) Execute ladder diagram for interfacing of lamp and button for ON / OFFoperation

vii) Execute ladder diagram for Stair CaseLighting

viii) Execute ladder diagram for TemperatureController

Ladder Diagrams for industrial applications

ix) Execute ladder diagram for DOLstarter

x) Execute ladder diagram for Star-Deltastarter

xi) Execute ladder diagram for PMDC Motor SpeedController

xii) Execute ladder diagram for Traffic LightController

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-509A.1	3	1						3		
EE-509A.2	3	1		1	1			3	1	1
EE-509A.3	3		1	1	1			3	1	1
EE-509A.4	3		1	1	1			3	1	
Average	**3**	**1**	**1**	**1**	**1**			**3**	**1**	**1**

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Basics of PLC

Demonstrate PLC architecture - Working with various tools available in PLC software - Preparation of ladder diagram, uploading of code to PLC and running the code on PLC

Ladder Diagrams for logic gates, timers and counters

Execute ladder diagram for different Logical Gates - ladder diagram using timers & counters Ladder Diagrams for domestic applications

Execute ladder diagram for interfacing of lamp and button for ON / OFF operation - ladder diagram for Stair Case Lighting - ladder diagram for Temperature Controller

Ladder Diagrams for industrial applications

Execute ladder diagram for DOL starter - ladder diagram for Star-Delta starter - ladder diagram for PMDC Motor Speed Controller - ladder diagram for Traffic Light Controller

POWER ELECTRONICS AND MATLAB

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-509 B	POWER ELECTRONICS AND MATLAB	3	45	40	60

COURSE OUTCOMES MAPPING

S.No	Major Topics	No. of periods	CO's Mapped
1.	Characteristics of different Power Electronic Devices	6	CO1
2.	Study the working of different Power Electronic circuits	9	CO2
3.	Speed control of the electrical motors using the PowerElectronic Devices	9	CO3
4	Fundamentals of Simulation using MATLAB	6	CO4
5.	Simulation of Converter and Inverter using MATLAB	9	CO5
6.	Simulation of AC Voltage Controller and Chopper using MATLAB	6	CO5
	Total	**45**	

COURSE OBJECTIVES	i) To expose students to operation and characteristics of power semiconductor devices and passive components, their practical application in powerelectronics.
	ii) To provide a practical exposure to operating principles, design and synthesisof different power electronic converters.
	iii) To use MATLAB for simulation of different Power Electronics circuits.

COURSE OUTCOMES	CO1	EE-509B.1	Conduct suitable experiment to draw characteristics of various power semiconductor devices.
	CO2	EE-509B.2	Analyze working of power electronics circuits.
	CO3	EE-509B.3	Conduct test to control the speed of electrical motors using power electronic devices.
	CO4	EE-509B.4	Describe the MATLAB for interactive computations.
	CO5	EE-509B.4	Similate converter and inverter circuits using MATLAB.

LEARNING OUTCOMES

Plot the Characteristics of the different Power Electronic Devices

i) Plot the Characteristics ofSCR
ii) Plot the Characteristics of TRIAC.
iii)Plot the Characteristics of IGBT and MOSFET

Study the working of different Power Electronic circuits

iii) Study of the working of single phase half waveconverter

iv) Study of the working of single phase full waveconverter

v) Study of the working of single phase full wave bridgeconverter

Speed control of the electrical motors using the Power Electronic Devices

vi) Speed Control of DC motor using single phase bridgeconverter

vii) Speed Control of DC motor usingchopper

viii) Speed Control of 1-phase AC induction motor using AC voltagecontroller

Fundamentals of Simulation using MATLAB

ix) Introduction to SIM PowerSystems
x) Working with the different blocks of SIM PowerSystems

Simulation of Converter and Inverter using MATLAB

xi) Simulation of single phase full wave converter circuit usingMATLAB
xii) Simulation of three phase bridge converter circuit usingMATLAB
xiii) Simulation of single phase bridge inverter circuit usingMATLAB

Simulation of AC Voltage Controller and Chopper using MATLAB

xiv) Simulation of single phase AC Voltage Controller circuit usingMATLAB
xv) Simulation of bridge chopper circuit usingMATLAB

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-509B.1	3							3		
EE-509B.2	3	1						3		
EE-509B.3	3	1						3		
EE-509B.4	3	1	1					3	1	
EE-509B.5	3	1	1	1				3	1	1
Average	**3**	**1**	**1**	**1**				**3**	**1**	**1**

3-Strongly Mapped 2- Moderately Mapped 1- Slightly Mapped

Note:
The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quizzes (vii) Industrial Visits (viii) Tech Fests (ix) Mini Projects (x) Library Visits

HYPONATED COURSE CONTENTS

Plot the Characteristics of the different Power Electronic Devices.

Plot the Characteristics of SCR – TRIAC-IGBT-MOSFET.

Study the working of different Power Electronic circuits

Study of the working of single phase half wave converter - single phase full wave converter - single phase full wave bridge converter

Speed control of the electrical motors using the Power Electronic Devices

Speed Control of DC motor using single phase bridge converter - Speed Control of DC motor using chopper - Speed Control of 1-phase AC induction motor using AC voltage controller

Fundamentals of Simulation using MATLAB

Introduction to SIM Power Systems - Working with the different blocks of SIM Power Systems

Simulation of Converter and Inverter using MATLAB

Simulation of single phase full wave converter circuit - three phase bridge converter circuit - single phase bridge inverter circuit

Simulation of AC Voltage Controller and Chopper using MATLAB

Simulation of single phase AC Voltage Controller circuit - bridge chopper circuit

DIGITAL ELECTRONICS AND MICROCONTROLLERS LABORATORY

Course Code	Course Title	No. of periods / Week	Total No. of Periods	Marks for FA	Marks for SA
EE-510	DIGITAL ELECTRONICS AND MICROCONTROLLERS	(3)	(45)	40	60

COURSE OUTCOMES MAPPING

S.No	Major Topics	No. of periods	CO's Mapped
1.	Logic Gates	6	CO1
2.	Combinational Logic Circuits	10	CO2
3.	Sequential Logic Circuits	10	CO3
4	Basics of Microcontrollers	8	CO4
5	Programming on Microcontrollers	20	CO5

COURSE OBJECTIVES	i. To understand number representation and conversion between different representation in digital electronic circuits.
	ii. To analyze logic processes and implement logical operations using combinational logic circuits.
	iii. To know the importance of different peripheral devices and their interfacing to microcontrollers.
	iv.To know the design aspects of microcontrollers and to write assembly language programs of microcontrollers for various applications.

COURSE OUTCOMES	**CO1**	EE-510.1	Understand theory of Boolean Algebra & the underlying features of various number systems.
	CO2	EE-510.2	Apply the concepts of Boolean Algebra for the analysis & design of various combinational & sequential logic circuits.
	CO3	EE-510.3	Analyze the sequential logic circuits design both in synchronous and asynchronous modes for various complex logic and switching devices.
	CO4	EE-510.4	Interpret various peripheral devices to the microcontrollers.
	CO5	EE-510.5	Write assembly language program for microcontrollers and Design microcontroller based system for various applications.

LEARNING OUTCOMES

Logic Gates

1.1 Verify the truth tables of basic gates and universal gates.

1.2 Show NAND gate and NOR gate as Universal gates.

Combinational Logic Circuits

2.1 Realize a given boolean function and obtain its truth table.

2.2 Construct half adder and full adder and verify the truth tables.

2.3 Verify the function of 74138 decoder IC.

2.4 Verify the working of Multiplexer (Using IC 74153)

2.5 Verify the functional table of 4-bit magnitude comparator 7485 IC.

Sequential Logic Circuits

3.1 Construct and verify the truth tables of NAND & NOR latches

3.2 Construct clocked RS FF using NAND gates and Verify its truth table.

3.3 Verify the truth table of JK FF using 7476 IC.

3.4 Construct D and T flip flops using 7476 and verify the truth tables.

Basics of Microcontrollers

4.1 Familiarization of 8051 Microcontroller Kit.

4.2 Familiarization of 8051 simulator EDSIM 51 (or similar).

Programming on Microcontrollers

5.1 Write a program to demonstrate different register addressing techniques on 8051

5.2 Write a program to demonstrate Addition, subtraction, division and multiplication of 8 bit numbers using immediate data access on 8051.

5.3 Write a program to Add and Subtract 16 bit numbers on 8051.

5.4 Control a RGB led with Arduino.

5.5 Control a Servo motor with Arduino.
5.6 Control a PMDC motor with Arduino.
5.7 Interface an LCD display with Arduino.
5.8 Control a small pump using moisture sensor and Arduino

CO'S AND PO'S MAPPING STRENGTH

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
EE-510.1	3							3		
EE-510.2	3	1						3		
EE-510.3	3	1						3		
EE-510.4	3	1	1					3	1	
EE-510.5	3	1	1					3	1	1
Average	**3**	**1**	**1**					**3**	**1**	**1**

HYPONATED COURSE CONTENTS

Logic Gates
Verify the truth tables of basic gates and universal gates - Show NAND gate and NOR gate as Universal gates.

Combinational Logic Circuits
Realize a given boolean function and obtain its truth table - Construct half adder and full adder and verify the truth tables - Verify the function of 74138 decoder IC - Verify the working of Multiplexer (Using IC 74153) - Verify the functional table of 4-bit magnitude comparator 7485 IC.

Sequential Logic Circuits
Construct and verify the truth tables of NAND & NOR latches - Construct clocked RS FF using NAND gates and Verify its truth table - Verify the truth table of JK FF using 7476 IC - Construct D and T flip flops using 7476 and verify the truth tables.

Basics of Microcontrollers
Familiarization of 8051 Microcontroller Kit - Familiarization of 8051 simulator EDSIM 51 (or) similar

Programming on Microcontrollers
Write small ALP to demonstrate different register addressing techniques - Write an ALP to demonstrate Addition, subtraction, division and multiplication of 8 bit numbers using immediate data access - Write an ALP to Add and Subtract 16 bit numbers – Arduino Programming.

PROJECT WORK

Subject Title	Subject Code	Periods per Week	Periods per Semester
PROJECT WORK	EE – 511	03	45

Upon completion of the course the student shall be able to		
Course Objectives		• Enhance the knowledge by field visits • Provide with the opportunity to synthesize knowledge from various areas of learning • Critically and creatively apply it to real life situations
COURSE OUT COMES	CO1	Organising teamwork.
	CO2	Innovative learning .
	CO3	Apply theoretical knowledge to practical work situations.
	CO4	Practice technical project reports preparation and presentation.

PO-CO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1						2				
CO2							2			
CO3			3							
CO4						2				

3: High, 2: Moderate,1: Low

Note:

The gaps in CO and PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest Lectures (v) Group Discussions (vi) Quiz (vii) Industry Visits (viii) Tech Fest (ix) Mini Projects (x) Library Visits.

Learning Outcomes

Upon completion of the course the student shall be able to

1.0 Problem solving and Critical Thinking

1.1. Generate Ideas from electrical courses.
1.2. Develop these Ideas.
1.3. Gather relevant Information.
1.4. Evaluate Ideas.
1.5. Apply these ideas to a specific task.
1.6. Execute appropriate Laboratory skills
1.7. Draw Appropriate Conclusions

2.0 Communication

2.1 Communicate effectively.
2.2 Present Ideas Clearly.
2.3 Present Ideas Coherently.
2.4 Report writing

3.0 Collaboration

3.1. Discuss the ideas.
3.2 Coordinate with team members
3.3. Team work in accomplishing the task.

4.0 Independent Learning

4.1. Involves in the group task.

4.3. Analyze the appropriate actions.

4.4. Compares merits and demerits

4.5. Analyze the activities for sustainability.

4.6 Analyze the activities to ensure ethics

5.0 Ethics

5.1 Give respect and value to all classmates, educators, colleagues, and others

5.2 Understand the health, safety, and environmental impacts of their work

5.3 Recognize the constraints of limited resources

5.4 Develop sustainable products and processes that protect the health, safety, and prosperity of future generations

5.5 Maintain integrity in all conduct and publications and give due credit to the contributions of others

COURSE CONTENT

1.0 Design &Analysis/ Case Study Projects in the areas of Electrical and Electronics Engineering and other related areas

Weightage of marks for Assessment of Learning Outcomes of Project work

S.No	Item	Marks
1	**Internal Marks** Demonstration of Assigned task in the group to complete the project	**40**
	End Exam Marks: **Demonstration of skill relevant to the project (30)** **Project Report(20)** **Viva Voce(10)**	**60**
Total marks		**100**

- End Examination assessment shall be done by both internal, external examiners and faculty members who guided the students during project work.

VI SEMESTER

DIPLOMA IN ELECTRIAL AND ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI SEMESTER
INDUSTRIAL TRAINING

Sl. No.	Course Title	Duration	Scheme of evaluation			Remarks
			Item	Nature	Max. Marks	
1	Industrial Training	6 months	1.First Assessment at training place/ Industry (After 12 Weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	120	Pass marks is 50% in assessment at training place/industry (first and second assessment put together)
			2.Second Assessment at training place/Industry (After 22 weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	120	
			Final Summative assessment at institution level after completion of training.	Training Report	20	Pass marks is 50% in final summative assessment
				Demonstration of any one of the skills listed in learning outcomes	30	
				Viva Voce	10	
TOTAL MARKS					300	

INDUSTRIAL TRAINING

Subject Title	Subject Code	Duration
Industrial Training	EE-601	6 months

Time schedule

S.NO	Code	TOPICS	Duration
1	EE-601	• Practical training in Industry • Training Report Preparation Report Preparation: Title Page, Certificate, Acknowledgements, Abstract, Contents(introduction of Industry, Organization Chart, List of Major Equipments, List of Processes: Skills Acquired; Conclusions; Bibliography	Six Months

Course Objectives and Course Outcomes

Upon completion of the course the student shall be able to		
Course Objectives		1.Expose to real time working environment 2. Enhance knowledge and skill already learnt in the institution. 3. Acquire the required skills of assembling, dismantling, testing, troubleshooting, observing and supervising in electrical engineering fields.
COURSE OUT COMES	**CO1**	Apply theory to practical work situations
	CO2	Cultivate sense of responsibility and good work habits
	CO3	Exhibit the strength, teamwork spirit and self-confidence
	CO4	Gaining knowledge in installations, manufacturing, operations and maintaining various electrical goods and appliances.
	CO5	Writing reports and auditing in electrical projects.

PO-CO Mapping

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1			2		1	3		2
CO2	3					3		3		2
CO3	3					3		3		2
CO4	3	1	1			3		3	1	2
CO5	3	1						3		2
Average	**3**	**1**	**1**		**2**	**3**	**1**	**3**	**1**	**2**

3: High, 2: Moderate, 1: Low

Learning Outcomes

The student shall be able to display the following skill sets

1) Technical Skills (Manufacturing/Service/Name plate details /Identification of components,Tools etc.,)
2) Reading,Observing, drawing and analysing Specifications
3) Using of Tools/Instruments /Materials/Machines
4) Assembling, dismantling, testing, repair and maintenance skills.
5) Assess and Control of quality parameters,Practice of Safety measures and Precautions while handling the Electrical equipment
6) Planning, Organizing, Recording,Communicating,Supervising and report submission Skills

Scheme of evaluation

Sl.No.	Course Title	Duration	Scheme of evaluation		
			Item	Nature	Max. Marks
1	Industrial Training	6 months	1.First Assessment at Industry (After 12 Weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	120
			2.Second Assessment at the Industry (After 22 weeks))	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	120
			Final Summative assessment at institution level	Training Report	20
				Demonstration of any one of the skills listed in learning outcomes	30
				Viva Voce	10
TOTAL MARKS					300

Weightage of marks for Assessment of Skill sets during first and second assessment.

Skill Set Sl.No	SKILL SETS	Max Marks Allotted For each parameter
1	Technical Skills (Manufacturing/Service/Name plate details /Identification of components,Tools etc.,)	20
2	Reading,Observing, drawing and analysing Specifications	15
3	Using of Tools/Instruments /Materials/Machines	20
4	Assembling, dismantling, testing, repair and maintenance skills.	20
5	Assess and Control of quality parameters,Practice of Safety measures and Precautions while handling the Electrical equipment	20
6	Planning, Organizing, Recording,Communicating,Supervising and report submission Skills	25
	Total	**120**

During assessment the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the weightage assigned as above. In case the student has undergone training in a few skill sets then the total marks obtained shall be raised to 120 marks for the given assessment i.e. either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skill sets.

Illustration

If the student has undergone training in only 4 skill sets (namely serial number 1, 3, 4, 5 of above skill sets) and marks awarded during assessment is 50 out of 80 marks, then the marks of 50 shall be enhanced to 120 proportionately as (50/80)*120=75.

GUIDELINES FOR INDUSTRIAL TRAINING OF DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING PROGRAMME:

1. Duration of the training: 6 months.
2. Eligibility: As per SBTET norms
3. Training Area: Students can be trained in APGENCO/APTRANSCO/APDISCOM/Captive Power plants/Wind power plants,/Solar power plants/Milk factories/Railways/Roadways/Communication sectors/Television sectors/Public and private Organizations or industries or companies etc., related to electrical & electronics fields.

4. The Industrial Training shall carry 300 marks and pass marks is 50% in assessment at industry (first and second assessment put together) and also 50% in final summative assessment at institution level.
5. Formative assessment at industry level shall be carried out by the representative of the industry, where the student is undergoing training and the faculty from the concerned section in the institution.
6. If the student fails to secure 50% marks in industrial assessments put together, the student should reappear for 6 months industrial training at his/her own expenses.
7. If the student fails to secure 50% marks in final summative assessment at institution level, the student should reappear for final summative assessment in the subsequent board examination.
8. Final Summative assessment at institution level is done by a committee including **1. Head of the section (of concerned discipline ONLY), 2. External examiner from an industry and 3. Faculty member who assessed he student during industrial training as member.**
9. During Industrial Training the candidate shall put a minimum of 90% attendance.
10. If the student fails to secure 90% attendance during industrial training, the student should reappear for 6 months industrial training at his/her own expenses.

Guidelines and responsibilities of the faculty members who are assessing the students performance during industrial training:

- Shall guide the students in all aspects regarding training.
- Shall create awareness regarding safety measures to be followed in the industry during the training period, and shall check it scrupulously.
- Shall check the logbook of the students during the time of their visit for the assessment.
- Shall monitor progress at regular intervals and make appropriate suggestions for improvement.
- Shall visit the industry and make first and second assessments as per stipulated schedules.
- Shall assess the skill sets acquired by the students during their assessment.
- Shall award the marks for each skill set as per the marks allotted for that skill set during 1^{st} and 2^{nd} assessments
- Shall voluntarily supplement students learning through appropriate materials like photographs, articles, videos etc.
- Shall act as co-examiner along with other examiners in the final assessment at institution.
- Shall act as liaison between the student and mentor.
- Shall maintain a diary indicating his observation with respect to the progress of students learning in all three domains (Cognitive, Psychomotor and Affective).

Guidelines to the Training Mentor in the industry:

- Shall train the students in all the skill sets as far as possible.
- Shall assess and award the marks in both the assessments along with the faculty member.
- Shall check and approve the log books of the students.
- Shall approve the attendance of each student at the end of the training period.
- Shall report to the guide about student's progress, personality development or any misbehavior as the case may be.
- ✓ **Every Teacher (including HoD if not holding any FAC) shall be assigned a batch of students of 10 to 15 for industrial training irrespective of student's placements for training.**

Rubrics for assessment
Department of Technical Education
Name of the institution
Industrial training assessment

PROFORMA

PIN: **Name of the student:**

Skill Set Sl.No	*SKILL SET*	**Max Marks Allotted For each parameter**	**Precisely completes the task**	**Completes the task, mistakes are absent, but not Precise**	**Completes the task, Mistakes are a few**	**Makes attempt, Mistakes are many**
1	**Technical Skills (Manufacturing/Service/Name plate details /Identification of components,Tools etc.,) (20)**					
	(i) Identification of components and tools.	*5*	*5*	*3*	*2*	*1*
	(ii) Identification of name plate details of machine/equipment.	*5*	*5*	*3*	*2*	*1*
	(iii) Explaining manufacturing procedure.	*5*	*5*	*3*	*2*	*1*
	(iv) Identification of service requirement.	*5*	*5*	*3*	*2*	*1*
2	**Reading, Observing, drawing and analysing Specifications. (15)**					
	(i) Analysing specifications of machine/ equipment.	*5*	*5*	*3*	*2*	*1*
	(ii) Drawing circuit diagram/schematic diagram of the manufacturing process.	*5*	*5*	*3*	*2*	*1*
	(iii) Observing readings of various parameters.	*5*	*5*	*3*	*2*	*1*
3	**Using of Tools/Instruments /Materials/Machines (20)**					
	(i) Use of proper Tools/Instruments	*10*	*10*	*7*	*6*	*3*
	(ii) Materials/Machinery required for the process	*10*	*10*	*7*	*6*	*3*
4	**Assembling, dismantling, testing, repair and maintenance skills (20)**					
	(i) Assembling and Dismantling	*10*	*10*	*7*	*6*	*3*
	(ii) Testing	*5*	*5*	*3*	*2*	*1*
	(iii) Repair and maintenance	*5*	*5*	*3*	*3*	*2*

5	**Assess and Control of quality parameters, Practice of Safety measures and Precautions while handling the Electrical equipment (20)**					
	(i) Assess and control of quality parameters.	*10*	*10*	*7*	*6*	*3*
	(ii) Safety and precautions for handling the equipment.	*10*	*10*	*7*	*6*	*3*
6	**Planning, Organizing, Recording,Communicating,Supervising and report submission Skills*(25)***					
	(i) Planning and organising.	*10*	*10*	*7*	*6*	*4*
	(ii) Maintenance of records in the work place.	*5*	*5*	*3*	*3*	*2*
	(iii) Communication and Supervising skill.	*5*	*5*	*4*	*3*	*2*
	(iv) Reporting technical issues.	*5*	*5*	*3*	*3*	*2*

*Mistakes are with reference to Technique, Procedure & precautions, while precision refers to technique, procedure, precautions, time & result.

(Marks awarded in words:)

Signature of the Training In-charge (Mentor)
Name
Designation

Signature of the faculty incharge (Guide)
Name
Designation

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