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

APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING

CURRICULUM -2020

(C-20)

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(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 reportedto 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 40/20 sessional 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 shallbe 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:

<table>
<tr><th>Assessment no</th><th>Upon completion of</th><th>By</th><th>Based on</th><th>Max Marks</th></tr>
<tr><td>1</td><td>12 weeks</td><td rowspan="2">1.The faculty concerned (Guide) and
2. Training in charge (Mentor) of the industry</td><td rowspan="2">Learning outcomes as given in the scheme of assessment ,for Industrial Training</td><td>120</td></tr>
<tr><td>2</td><td>22 weeks</td><td>120</td></tr>
<tr><td rowspan="3">3.Final summative Evaluation</td><td rowspan="3">24 week</td><td rowspan="3">1.The faculty member concerned,
2.HoD concerned and
3.An external examiner</td><td>1.Demonstration of any one of the skills listed in learning outcomes</td><td>30</td></tr>
<tr><td>2.Training Report</td><td>20</td></tr>
<tr><td>3.Viva Voce</td><td>10</td></tr>
<tr><td colspan="4">TOTAL</td><td>300</td></tr>
</table>

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.

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 BRANCH: EIE

All the Subjects in earlier curriculum are reviewed and the following specific changes are discussed and incorporated.

(i) In course AEI-105-Electronic Components & Devices, the following topic is incorporated as suggested by the expert academician is definition of polarisation in dielectric material properties.

(ii) In course AEI-108-Electrical wiring, Electronic components and Devices Lab ,the following topics incorporated
(i)DPST switch
(ii)Use of fuse and variac

(iii) In course AEI-302-Electronic Circuits, the PSPICE software introduced for simulation of circuits.

(iv) In course AEI-311-Programming in C Lab changed as AEI-311-Programming in C and MAT Lab with incorporation of MAT Lab.

(v) In course AEI-409-Microcontrollers lab, Kiel software is introduced.

(vi) In course AEI-405- Industrial Electronics, Power electronics, Inverters, UPS and SMPS are incorporated.

(vii) In course AEI-501-IMST, the personal protective equipment & quality control topics are introduced.

(viii)AEI-510 –Field practices is incorporated in V semester.

(ix)AEI-511-Project work is incorporated in V semester.

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 DAEIE
With Training

VISION

To constantly strive to make this department a universal level Polytechnic in Applied Electronics and Instrumentation Engineering.

MISSION

M1	To provide high quality education which inspire the students to realize their aspiration and potential.
M2	To enhance knowledge, create passion for learning, foster innovation and nurture talents towards serving the society and the country.
M3	To encourage faculty members to update their knowledge and carryout advanced study in cutting edge technologies.
M4	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.

Programme Educational Objectives (PEOs)

The major objectives of the Diploma in Applied Electronics and Instrumentation Engineering are, to prepare students

PEO1	For employment in the core industrial/manufacturing sector.
PEO2	For employment in research and development organizations.
PEO3	For graduate studies in engineering and management.
PEO4	For entrepreneurship in the long run.

PROGRAMME OUTCOMES (POs)

The students, after undergoing the Diploma in Applied Electronics and Instrumentation Engineering,

PO1. **Basic and discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

PO2. **Problem analysis**: Identify and analyse well-defined engineering problems using codified standard methods

PO3. **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

PO4. **Engineering tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO5. **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

PO6. **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.

PO7. **Life-long learning**: Ability to analyse individual needs and engaging updating in the context of technological changes.

Program Specific Outcomes (PSOs):

The students of Applied Electronics and Instrumentation Engineering (AEIE) will be able to:
PSO1: Apply the fundamentals of electrical, electronic, computer, mathematics, science and engineering knowledge to identify, design, develop and investigate complex problems of electrical and electronic circuits, electronic process instrumentation, measurement and process control field.

PSO2: Apply appropriate technique and modern engineering hardware and software tools to design, develop, measure and control the electronic and instrumentation system to engage in life-long learning and work efficiently as an individual and in a multidisciplinary team.

PSO3: Explainthe impact of professional behaviour and ethics and effective communication with engineering community and the society.

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

FIRST YEAR

Subject Code	Name of the Subject	Instruction periods/ week		Total Periods /year	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
AEI-101	English	3	-	90	3	20	80	100
AEI-102	Mathematics - I	5	-	150	3	20	80	100
AEI-103	Engineering Physics	4	-	120	3	20	80	100
AEI-104	Engineering Chemistry & Environmental Studies	4	-	120	3	20	80	100
AEI-105	Electronic components and devices	4	-	120	3	20	80	100
AEI-106	Basic Electrical Engineering	4	-	120	3	20	80	100
PRACTICAL								
AEI-107	Engineering Drawing	-	6	180	3	40	60	100
AEI-108	Electrical Wiring, Electronic components & Devices Lab	-	6	180	3	40	60	100
AEI-109	109-A Physics Lab	-	1.5	45	3(1.5+1.5)	20	30	100 (50+50)
	109-B Chemistry Lab		1.5	45		20	30	
AEI-110	Computer Fundamentals Lab	-	3	90	3	40	60	100
	TOTAL	24	18	1260	-	280	720	1000

AEI- 101, 102, 103, 104, 107, 109, 110 common with all branches.

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

III SEMESTER

Subject Code	Name of the Subject	Instruction period / week		Total Periods /semester	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
AEI-301	Mathematics – II	4	-	60	3	20	80	100
AEI-302	Electronic circuits	4		60	3	20	80	100
AEI-303	Digital Electronics	5		75	3	20	80	100
AEI-304	Electronic Measuring Instruments	4		60	3	20	80	100
AEI-305	Process Instrumentation	5		75	3	20	80	100
AEI-306	Programming in C	5		75	3	20	80	100
PRACTICAL								
AEI-307	Electronic circuits Lab		3	45	3	40	60	100
AEI-308	Digital Electronics Lab		3	45	3	40	60	100
AEI-309	Electronic Measuring Instruments Lab		3	45	3	40	60	100
AEI-310	Process Instrumentation Lab		3	45	3	40	60	100
AEI-311	Programming In C and MATLAB		3	45	3	40	60	100
TOTAL		**27**	**15**	**630**	**-**	**320**	**780**	**1100**

AEI-301 common with all branches

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

IV SEMESTER

Subject Code	Name of the Subject	Instruction periods/week		Total Periods /semester	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	EndExam Marks	Total Marks
THEORY								
AEI-401	Engineering Mathematics – III	3	-	45	3	20	80	100
AEI-402	Linear Integrated Circuits	5		75	3	20	80	100
AEI-403	Micro Controllers and Applications	5		75	3	20	80	100
AEI-404	Process control	5		75	3	20	80	100
AEI-405	Industrial Electronics	4		60	3	20	80	100
AEI-406	Analytical Instrumentation	5		75	3	20	80	100
PRACTICAL								
AEI-407	Linear IC Applications and e-CAD Lab		3	45	3	40	60	100
AEI-408	Communication Skills		3	45	3	40	60	100
AEI-409	Micro Controllers and Applications Lab		3	45	3	40	60	100
AEI-410	Process control Lab		3	45	3	40	60	100
AEI-411	Analytical Instrumentation Lab		3	45	3	40	60	100
TOTAL		27	15	630	-	320	780	1100

AEI-401,408 common with all branches.

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

V SEMESTER

Subject Code	Name of the Subject	Instruction periods / week		Total Periods /semester	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	EndExam Marks	Total Marks
THEORY								
AEI-501	IM&ST	4	-	60	3	20	80	100
AEI-502	Biomedical Instrumentation	5		75	3	20	80	100
AEI-503	Control Systems	5		75	3	20	80	100
AEI-504	Industrial Automation	5		75	3	20	80	100
AEI-505	Instrumentation in Process Industries	4		60	3	20	80	100
AEI-506	Communication Engineering	4		60	3	20	80	100
PRACTICAL								
AEI-507	Biomedical Instrumentation Lab		3	45	3	40	60	100
AEI-508	Life skills		3	45	3	40	60	100
AEI-509	PLC and SCADA Lab		3	45	3	40	60	100
AEI-510	Field Practices		3	45	3	40	60	100
AEI-511	Project Work		3	45	3	40	60	100
TOTAL		27	15	630	-	320	780	1100

AEI-508 common with all branches.

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

VI SEMESTER

Scheme of evaluation

Sl.No.	Subject	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 20 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

GUIDELINES FOR INDUSTRIAL TRAINING OF DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING PROGRAMME

- Duration of the training: 6 months.
- Eligibility: As per SBTET norms
- Training Area: Students can be trained in Industry certification
- The Industrial Training shall carry maximum 300 marks
- Pass marks is 50% in assessment at industry (first and second assessment put together) and also 50% in final summative assessment at institution level.
- 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.
- If the student fails to secure 50% marks in assessment at industry (first and second assessment put together), the student should reappear for 6 months industrial training at his/her own expenses.
- 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.
- Final Summative assessment at institution level is done by both internal, external examiners and faculty members who assessed the students during Industrial Training.
- During Industrial Training the candidate shall put a minimum of 90% attendance.

  If the student fails to secure 90% attendance during industrial training, the student should reappear for 6 months industrial training at his/her own expense.

FIRST YEAR

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

FIRST YEAR

Subject Code	Name of the Subject	Instruction periods / week		Total Periods /year	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
AEI-101	English	3	-	90	3	20	80	100
AEI-102	Mathematics - I	5	-	150	3	20	80	100
AEI-103	Engineering Physics	4	-	120	3	20	80	100
AEI-104	Engineering Chemistry & Environmental Studies	4	-	120	3	20	80	100
AEI-105	Electronic components and devices	4	-	120	3	20	80	100
AEI-106	Basic Electrical Engineering	4	-	120	3	20	80	100
PRACTICAL								
AEI-107	Engineering Drawing	-	6	180	3	40	60	100
AEI-108	Electrical Wiring, Electronic components & Devices Lab	-	6	180	3	40	60	100
AEI-109	109-A Physics Lab	-	1.5	45	3(1.5+1.5)	20	30	100 (50+50)
	109-B Chemistry Lab		1.5	45		20	30	
AEI-110	Computer Fundamentals Lab	-	3	90	3	40	60	100
	TOTAL	24	18	1260	-	280	720	1000

AEI- 101, 102, 103, 104, 107, 109, 110 common with all branches.

ENGLISH

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
AEI-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 **AEI-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**	**Remarks**
		Number	**Percentage**	**(1,2,3)**	
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	10*		1*	1		CO1, CO2, CO3, CO4
7	The Rainbow of Diversity	8				3				1		CO1, CO2, CO3, CO4
8	New Challenges - Newer Ideas	8	35		8*	8*+ 3+3+			1*	4		CO1, CO2,

						3						CO3, CO4
9	The End Point First!	8									1*	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 — All Questions are compulsory : 60 minutes
PART-B: 5 Questions 8 marks each =40 Marks — Internal choice : 90 minutes
Part-C: 1 Question 10 marks =10 Marks
(Higher Order Question) — 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 and

writing about routines, professions, scientific descriptions and sports commentary.

5.3 Write paragraphs with coherence and other necessary skills.

6. Preserve or Perish

6.1. Explain 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

C-20- AEI-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)**

7. 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

C-20-AEI-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

C-20-AEI-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

C-20-AEI-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
c) the judge?
d) What did the neighbour’s sons do with the gifts they received?
e) How did the dogs stop bothering the farmer’s lambs?
f) What items are exchanged happily between the two neighbours?
g) Pick the word from the passage that did the farmer consult the judge?
h) What would be the consequence if the judge punished the neighbor?
i) What was the solution suggested by 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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Engineering Mathematics-I

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
AEI-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

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

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

1.8 Define a matrix and order of a matrix.

1.9 State various types of matrices with examples (emphasis on 3rd 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 a square matrix into a sum 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 matrix with examples. Expand the determinant of a 3 x 3 matrix using Laplace expansion formula. State and apply the properties of determinants to solve problems.

1.14 Distinguish singular and non-singular matrices. Define multiplicative inverse of a matrixand list properties 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 Inversion method.

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 $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ 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 Explain 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.4Evaluate 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 principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ 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 Explainthe 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
2	CO1, CO2,	138	92%	3	

	CO3,CO4,CO5				addressed
3	CO1, CO2, CO3,CO4,CO5	133	88.6%	3	25% to 40% Level 2 Moderately addressed
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	5% to 25% Level 1 Low addressed
PSO 3	CO1, CO2, CO3,CO4,CO5	125	83.3%	3	<5% Not addressed

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. Explain 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.

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

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

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		Weightage Allotted	Marks wise distribution of weight age				Question wise distribution of weight age				COs mapped
	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	10	0	0	0	10	0	0	0	1	**CO5**
19	Physical Applications	2	2										
20	Maxima and Minima	3	4										
21	Errors and Approximations	2	1										
Total		**89**	**61**	**80**	**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

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, AEI -102**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **AEI-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, AEI -102**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **AEI- 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, AEI -102**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **AEI-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 $u(x, y) = \frac{x^4 + y^4}{x - y}$ (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 $5\,cm$. (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 AEI- 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. **CO 1**

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 $4x^2+16y^2=1.$ **CO 3**

15 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) If $u=\tan^{-1}\left(\frac{x^3-y^3}{x+y}\right),$ then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u.$ **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 AEI- 102

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

PART-A

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

1. If $f:R\to R$ is a bijective function such that $f(x)=ax+b$, then find $f^{-1}(x)$. **CO1**

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

3. If $A=\begin{bmatrix} 0 & -1 & 3 \\ 1 & 0 & 7 \\ -3 & x & 0 \end{bmatrix}$ is a skew-symmetric matrix, find the value of x. **CO1**

4. Find the value of $\sin^2 82\frac{1}{2}^0-\sin^2 22\frac{1}{2}^0$. **CO2**

5. Prove that $\frac{\cos 3A}{2\cos 2A-1}=\cos A$. **CO2**

6. Find the conjugate of the complex number $(3-2i).(4+7i)$ **CO2**

7. Find the equation of the line passing through the points $(1,2)$ and $(3,-4)$. **CO3**

8. Find $\lim_{x\to 2}\frac{x^5-32}{x-2}$. **CO4**

9. Differentiate $\sqrt{x}-\sec x+\log x$ w.r.t. x. **CO4**

10. If $u(x,y)=x^3-3axy+y^3$, then find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$. **CO4**

PART-B

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

11 A) Show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a).$ **CO1**

Or

B) Solve the system of equations $x+2y+3z=6, 3x-2y+4z=5$ and $x-y-z=-1$ using matrix inversion method. **CO1**

12 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 $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}.$ **CO2**

13 A) Solve $2\cos^2\theta - 3\cos\theta + 1 = 0.$ **CO2**

Or

B) In any $\Delta ABC,$ Show that $\sum a^3 \cos(B-C) = 3abc.$ **CO2**

14 A) Find the equation of the circle passing through the points $(0,0),(6,0)$ and $(0,8).$ **CO3**

Or

B) Find the equation of the rectangular hyperbola whose focus is $(1,2)$ and directrix is $3x+4y-5=0.$ **CO3**

15 A) If $\sin y = x\sin(a+y),$ then prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}.$ **CO4**

Or

B) If $y = \tan^{-1} x,$ then prove that $(1+x^2)y_2 + 2xy_1 = 0.$ **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 $\tan^{-1}\sqrt{2}.$ **CO4**

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Course code	Course Title	No. of Periods per week	Total No. of Periods	Marks for FA	Marks for SA
AEI-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 Explainand 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 Explainmagnetic field. To compute magnetic field strength on axial and equatorial lines of a bar magnet. To Usemodern 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 ExplainWheatstone's bridge with legible sketch.
10.5 Explain 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. Dimensionsand 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 (AEI-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 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

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 oblique Projection. **(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)**

***

UNIT TEST –II

Model Question Paper (C-20)

ENGINEERING PHYSICS (AEI–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 (AEI–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) Explain 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)**

***

BOARD DIPLOMA EXAMINATION, (C–20)
FIRST YEAR EXAMINATION
AEI–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 **1 x 10 = 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
AEI-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 AEI-104	**Engg. Chemistry and Environmental studies No of Cos;5**				**No Of periods 120**
POs	**Mapped with CO No**	**CO periods addressing PO in Col 1 NO**	**%**	**Level 1,2,3**	**remarks**
PO1	CO1,CO2,CO3, CO4,CO5	60	50%	3	>40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed)
PO2	CO1,CO2	13	10.8%	1	
PO3	CO2,CO3	10	8.3%	1	
PO4	CO1	10	8.3%	1	
PO5	CO4,CO5	15	12.5	1	
PO6					
PO7	CO4	12	10%	1	

- 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 Explain the methods of concentration of Ore; 1.Handpicking, 2.Levigation and 3. Froth Floatation

4.5 Explain 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 Explain 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 Explainthe 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 Explain 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 environmental studies

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 system1 2) Producers1 3) C onsumers 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 (AEI-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 (AEI-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 (AEI-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) 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)**

***

MODEL QUESTION PAPER (C-20)

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (AEI-104)

TIME: 3hrs Total Marks:80

PART-A **3x10=30M**

Instructions: (1) Answer all questions.

(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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ELECTRONIC COMPONENTS AND DEVICES

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-105	Electronic components and devices	4	120	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Resistors	15	CO1
2	Capacitors	13	CO1
3	Inductors	12	CO1
4	Switches and Relays	13	CO2
5	Microphones & Loud Speakers	15	CO3
6	Semiconductor Diode and Its applications	15	CO4
7	Transistors	15	CO5
8	Power supplies and Batteries	12	CO6
9	PCBs	10	CO7
	TOTAL	120	

Upon completion of the course the student shall be able to			
Course Objectives	(i) (ii) (iii) (iv)	Use passive components, switches, relays, microphones and loud speakers. Explain formation of semiconductor materials. Analyze the working of PN junction Diode in forward and reverse bias and Transistor and its configurations Explain rectifier circuits, DC power supplies, PCB materials and their fabrication	
Course	CO1	AEI-	Use different passive components.

outcomes		105.1	
	CO2	AEI-105.2	Usedifferent switches , relays.
	CO3	AEI-105.3	Usedifferent microphones, loud speakers.
	CO4	AEI-105.4	Analyze the working of semiconductor diodes.
	CO5	AEI-105.5	Analyze the working of Transistor and its configurations.
	CO6	AEI-105.6	Explain rectifier circuits and DC power supplies.
	CO7	AEI-105.7	Explain PCB materials and their fabrication.

Learning Outcomes

1.0 Resistors.

1.1 Explain the term resistance.
1.2 Classify types of resistors.
1.3 Derive the relation R=ρl/a
1.4 List the specifications of a resistor, and state their importance.
1.5 Explain the Color Code of a Resistor.
1.6 Find the value of Resistance by using colour code.
1.7 Derive the equivalent resistance when two resistors are connected in series.
1.8 Derive the equivalent resistance when two resistors are connected in parallel.
1.9 Simple problems on series and parallel connected resistors.
1.10 Explain the effect of temperature on resistance.
1.11 Define temperature co-efficient of resistance and derive the relation Rt=Ro(1+αot).
1.12 Compare the features of carbon film, metal film and wire wound resistors with respect to size, power rating, tolerance, temperature coefficient and applications.
1.13 Explain constructional details and working of carbon and wire wound potentiometers.
1.14 Compare the features of carbon and wire wound potentiometers
1.15 Mention the need for tapering in potentiometers.
1.16 Explain constructional details and working of rheostat and list its applications.
1.17 List the common faults in resistors.

2.0 Capacitors

2.1 Define the term capacitance.
2.2 Classify the types of capacitors.
2.3 List the specifications of a capacitor and state their importance.
2.4 State the factors affecting the capacitance of a capacitor.
2.5 List the properties of dielectric materials.

	2.6 Define Di-electric constant, Di-electric strength and polarization of a material. 2.7 State the properties, range of values and applications of paper, mica, glass, ceramic and electrolytic capacitors. 2.8 List types of variable capacitors and mention their applications. 2.9 List losses in capacitors. 2.10 Derive equivalent capacitance of Capacitors connected in i) series, and ii) parallel. 2.11 Simple problems on series and parallel connected capacitors. 2.12 List the common faults in capacitors. **3.0 Inductors** 3.1 Define self-inductance, mutual inductance and coefficient of coupling. 3.2 Draw the symbols of iron core, air core, and ferrite core inductors. 3.3 Simple problems on self inductance, mutual inductance and coefficient of coupling. 3.4 Classify inductors. 3.5 List the specifications of inductors. 3.6 List the various core materials used in the construction of inductors. 3.7 Derive equivalent inductance when they are connected in series aiding and opposing. 3.8 Write the expressions of inductance when they are connected in parallel aiding and opposing (No derivation). 3.9 Explain the constructional features of A.F. and R.F chokes. 3.10 List applications of A.F. and R.F chokes. **4.0 Switches and Relays** 4.1 Define a switch. 4.2 Classify switches according to poles and throws (SPST, SPDT, DPST, DPDT, Multipole multi-throw). 4.3 Sketch the I.S.I symbols of SPST, SPDT, DPST, DPDP, Multi-pole multi throw switches. 4.4 List different types of switches. 4.5 Explain the working of toggle, rotary, slider switches and mention their applications. 4.6 State the need of fuse in electronic equipment. 4.7 Mention different types of fuses. 4.8 Mention the ratings of fuse. 4.9 State the necessity of connectors in electronic circuits. 4.10 List different types of connectors. 4.11 Mention the use of MCB. 4.12 Define a relay. 4.13 Classify different relays based on principle of operation, polarization and application. 4.14 Mention specifications and applications of relays. 4.15 Explain the construction & working of general-purpose electromagnetic relay. 4.16 List the contact materials used in relays and list their characteristics. **5.0 Microphones & Loud Speakers** 5.1 Define Microphone. 5.2 List the different types of microphones based on impedance, polar characteristics and principle of working. 5.3 Explain the working of carbon, Crystal and dynamic microphones. 5.4 Mention the specifications of microphones.

	5.5 Define Loudspeaker. 5.6 Explain the constructional features and principle of operation of PMMC Loudspeaker. 5.7 Mention the necessity of Baffle for a Loudspeaker and list the types of Baffles (like open, infinite, bass reflex, acoustic labyrinth). 5.8 Mention the use of woofers and tweeters. 5.9 Give the need for a Horn loud speaker. 5.10 Mention the specifications of Loudspeaker. **6.0 Semiconductor Diode & its applications** 6.1 State the electrical properties of solid Semiconductor materials. 6.2 Sketch energy level diagrams for conductors, Semiconductors, Insulators. 6.3 Define Intrinsic and extrinsic Semiconductors. 6.4 Distinguish between Intrinsic and extrinsic Semiconductors. 6.5 Explain the formation of P- type and N-type materials and sketch the energy band diagrams. 6.6 Identify Majority and Minority carriers in P and N Type materials. 6.7 Distinguish between Drift and Diffusion current. 6.8 Explain the formation of PN junction diode. 6.9 Explain the working of PN junction Diode with various biasing voltages. 6.10 Sketch the forward and Reverse Bias Voltage characteristics of diode. 6.11 List the specifications of a diode. 6.12 List the applications of a diode.. 6.13 Draw and explain the working of clipper and clamper circuits using diodes. 6.14 Explain the formation and working of Zener diode. 6.15 Sketch the characteristics of Zener breakdown and Avalanche breakdown. 6.16 Distinguish between Zener breakdown and Avalanche breakdown. 6.17 Explain working principle and list applications of following a) Varactor diode b) Tunnel diode 6.18 Draw the symbols of PN junction diode, Zener diode, Varactor diode, and Tunnel diode. **7.0 Transistors** 7.1 State the formation of a transistor. 7.2 Draw the symbols and explain the working of PNP and NPN Transistors. 7.3 List transistor configurations. 7.4 Explain working of transistor as amplifier (CE configuration) 7.5 Draw and explain the different transistor configurations (CB, CC). 7.6 Define cut off, saturation and active regions. 7.7 Sketch the input/output characteristics of CB, CC and CE configurations. 7.8 Define alpha, beta and gamma Factors. 7.9 Obtain relation between alpha, beta and gamma Factors. 7.10 Write collector current expression in CB and CE modes of transistors in terms of □ , □ , IB, IC and ICBO, ICEO. 7.11 Compare the performance characteristics of transistor in CB, CE and CC configurations. **8.0 Power supplies and Batteries.** 8.1 State the necessity of D.C. power supply for Electronic circuits.

	8.2 Define cycle, Frequency, Time Period, Maximum Value, Average value, RMS value, Form Factor, peak factor for sinusoidal AC quantities. 8.3 Explain the working of HW, FW and Bridge Rectifier circuits with wave forms. 8.4 Define PIV, Ripple factor and Efficiency and write their expressions for the above circuits. 8.5 Compare HW, FW and Bridge Rectifiers 8.6 Define Voltage Regulation. 8.7 Define a filter circuit. 8.8 State the need for a filter circuit in power supplies. 8.9 List the types of filter circuits. 8.10 Explain the operation of C, LC, CLC filters. 8.11 State the need for a regulated power supply and list its specifications. 8.12 Explain the operation of simple Zener regulator. 8.13 List the types of storage batteries. 8.14 List the uses of storage batteries. 8.15 Compare lead acid and Nickel – iron cells. 8.16 Explain about maintenance free battery and list its applications. **9.0 PCBs** 9.1 State the need of PCB in electronic equipment. 9.2 Classify PCBs. 9.3 List types of laminates used in PCBs. 9.4 Explain the following in PCB Layout planning. a) Layout Scale b) Grid system. c) Spacing specifications for component holes and conductor widths. 9.5 List the methods of transferring layout on the copper clad sheet. 9.6 List the steps involved in screen-printing for making PCBs. 9.7 List the materials used in screen-printing. 9.8 Explain the photo processing technique for PCB preparation. 9.9 Explain the methods of etching, cleaning and drilling of PCB. 9.10 List the steps involved in making double-sided PCB. 9.11 List the materials used in soldering. 9.12 List the soldering methods of PCBs. 9.13 List the standard PCB specifications.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-105.1	**2**	**2**			**2**			**3**	**2**	**1**
AEI-105.2	**1**	**1**			**1**			**3**	**2**	**1**
AEI-105.3	**1**	**1**			**1**			**3**	**2**	**1**
AEI-105.4	**1**	**1**						**3**	**2**	**1**
AEI-105.5	**1**	**1**						**3**	**2**	**1**
AEI-105.6	**1**	**1**						**3**	**2**	**1**
AEI-105.7	**1**	**1**						**3**	**2**	**1**
Average	**1.14**	**1.14**			**1.34**			**3**	**2**	**1**

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENTS

1. **Resistors:** Classification of resistors, colour code, Specifications, Carbon film metal film, wire wound resistors. Constructional details of carbon and wire wound Potentiometers - tapering. Effect of temperature on resistance. Faults in resistors.
2. **Capacitors:** Classification, specifications of capacitors, dielectric constant, dielectricstrength, properties and applications of paper, mica, ceramic,glass and electrolyticcapacitors. Variable capacitors and applications, capacitor connected in series and parallel.
3. **Inductors**: Self Inductance, mutual inductance, coefficient of coupling, A.F. and R.F. chokes.
4. **Switches, connectors and Relays**: Different types of switches and connectors used inElectronic circuits and their specifications. Fuses. Types of relays-Relay contacts - Electromagnetic Relay.
5. **Microphones and Loudspeakers:** Types of microphones – carbon, dynamic and crystal. Constructional features, principle of working, characteristics, construction of PMMC Loudspeakers, Baffles, need for horn loud speaker.
6. **Semiconductor Diode:** Electrical properties ofsemiconductor materials, Energy leveldiagrams of conductors, semiconductors and Insulators, Formation of P-type and N-typematerials, PN junction diode with characteristics, Drift and Diffusion current, Diode clippers and clampers. Zenerdiode - Zener break down and Avalanche breakdown, Varactor diode, tunnel diode.
7. **Transistors:** Working of PNP and NPN transistors. Transistor configurations- CB,CE and CC, Input and Output characteristics, α, β, and γ factors, Relation between α, β, and γ- Comparisons of CB,CE and CC configurations.
8. **Power supplies and Batteries:** Need of DC power supply, Rectifiers- Half wave rectifier, full wave rectifier, bridge rectifier, RMS value, DC value, Ripple factor and

Efficiency, voltage regulation. Filters - C, LC, and CLC filters. Simple Zener regulator, Batteries-storage batteries.

9. **PCBs:** Classification of PCBs, screen-printing of PCBs, photo processing, double sided PCBs, soldering methods of PCBs, standard PCB specifications.

Reference Books

1. B. Soma Nathan Nair- Electronic devices and applications, PHI.
2. Anok Singh - Principles of Electronic Communications (For speakers & Microphones)
3. Dr.K.Padmanabham-Electronic components
4. V.K.Mehatha- Principles of Electronics, S Chand & Company Ltd.
5. Walter C. Bosshart - Printed Circuit Boards Design and Technology, TMH
6. Grob- Basic Electronics, TMH.
7. Millman&Halkias - Electronic devices & Circuits, TMH.
8. F.J. Waters- Electronic Components.

MODEL BLUE PRINT

S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Resistors	15	6	6	-			2	-			CO1
2	Capacitors	13	3	3	-			1	-			CO1
3	Inductors	12	3	3	-			1	-			CO1
4	Switches and Relays	13	11	3	8			1	1			CO2
5	Microphones & Loud Speakers	15	11	3	8			1	1			CO3
6	Semiconductor Diode and Its applications	15	11	3	8			1	1			CO4

7	Transistors	15	11	3	8			1	1			CO5
8	Power supplies and Batteries	12	11	3	8			1	1			CO6
9	PCBs	10	3	3	-			1	-			CO7
	Higher Order Question from chapters 1 or 2 or 3		10				10				1	CO1
	Total	**120**	**80**	**30**	**40**	**-**	**10**	**10**	**5**	**-**	**1**	**-**

Table specifying 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 6.18
Unit Test-III	From 7.1 to9.13

BOARD DIPLOMA EXAMINATIONS (C-20)

DAEIE-FIRST YEAR

ELECTRONIC COMPONENTS AND DEVICES (AEI-105)

Time: 3 Hours **Max Marks: 80**

PART –A

Instructions: 1) Answer all Questions. **10x3=30 M**

2) Each carries THREE marks.

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

1. List any three types of resistors. (CO1)
2. Define the term Resistance. (CO1)
3. Define the term capacitance. (CO1)
4. Write the expression for equivalent inductance when two inductors are connected in parallel aiding. (CO1)
5. Define a switch. (CO2)
6. Define microphone. (CO3)
7. Draw the symbols of PN junction diode and Zener diode. (CO4)
8. List any three Transistor configurations. (CO5)
9. Define Filter circuit. (CO6)
10. State any three standard PCB specifications. (CO7)

PART-B

Instructions:1) Answer either (A) or (B) from each question, each question carries Eight marks
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer. .

5x8=40 M

11. (A) Explain the working of slider switch and list any three applications. (CO2)

Or

(B) Explain the construction & working of general-purpose electromagnetic relay.(CO2)

12. (A) Explain the construction and working of PMMC Loudspeaker. (CO3)

Or

(B) Explain the working of carbon microphones. (CO3)

13. (A) Explain the formation of PN junction diode. (CO4)

Or

(B) Explain the formation and working of Zener diode. (CO4)

14. (A) Explain the input and output characteristics of CB configuration with diagram. (CO5)

Or

(B)Explain working of transistor as amplifier in CE configuration. (CO5)

15. (A) Explain the working of Bridge Rectifier circuit with wave forms. (CO6)

Or

(B) Explain about maintenance free battery and list any two applications. (CO6)

PART- C

1×10=10

Instructions: (1) Answer the following question. (2) Question carries ten marks.
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. In an electrical cable there is a single wire of radius 9mm of copper its resistance is 5 ohms .The cable replaced by 6 different insulated copper wires the radius of each wire is 3mm.Now find the total resistance of the cable. (CO1)

***

DAEIE- FIRST UNIT TEST

MODEL QUESTION PAPER(C-20)

ELECTRONIC COMPONENTS AND DEVICES (AEI-105)

Time: 90 Mins. Total Marks: 40M

PART- ATotal: 16M

Instructions: (1) Answer all questions.
(2) First question carries four marks and each of rest carries three 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. i) The symbol of resistor is---------- (CO1) 4X1M=4M
   ii) ------ is a passive component that restricts the flow of electric current. (CO1)
   iii) Capacitor is a device used to store electrical energy (True/False) (CO1)
   iv) Inductor is an active component. (True/False) (CO1)
2. Classify types of resistors. (CO1) 3M
3. Define Di-electric constant. (CO1) 3M
4. State the factors affecting the capacitance of a capacitor. (CO1) 3M
5. List any three specifications of inductors (CO1) 3M

PART- B3×8M=24M

Instructions: Answer either (A) or (B) from each question and each question carries Eight marks.

6. (A). Explain constructional details and working of rheostat and list its applications.(CO1)

Or

(B). Explain constructional details and working of carbon potentiometer. (CO1)

7. (A). State the properties, range of values and applications of paper and mica capacitors.(CO1)

Or

(B). State the properties, range of values and applications of ceramic and electrolytic capacitors. (CO1)

8. (A). Derive equivalent inductance when they are connected in series aiding and opposing. (CO1)

Or

(B). Explain the constructional features of A.F. and R.F chokes. (CO1)

***

BASIC ELECTRICAL ENGINEERING

Course code	Course title	No of periods/week	Total no. of periods	Marks for FA	Marks for SA
AEI-106	BASIC ELECTRICAL ENGINEERING	04	120	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	D.C Circuits and Network Theorems	25	CO1
2	Single phase A.C. circuits	30	CO2
3	Heating Effects of Electrical Current	15	CO3
4	Transformers	25	CO4
5	DC & AC Machines	25	CO5
	TOTAL	120	

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Usebasic electrical circuits like D.C Circuits and Network Theorems, Single phase A.C. circuits, Heating Effects of Electrical Current, Transformers, DC & AC Machines.

Course outcomes	CO1	**AEI-106.1**	Explainthe basics of D.C circuits and network theorems.
	CO2	**AEI-106.2**	Analyse the Single phase A.C circuits.
	CO3	**AEI-106.3**	Explainthe Heating Effects of Electrical Current.
	CO4	**AEI-106.4**	Explain the Transformer principle and list its Applications.
	CO5	**AEI-106.5**	Explainthe basic principle of D.C and A.C machines.
Learning Outcomes			

1.0 DC Circuits and Network Theorems.

1.1 Differentiate between active and passive circuits.
1.2 Define junction, branch and loop in a circuit.
1.3 State Kirchhoff‘s current law and voltage law.
1.4 Solve simple circuit problems by nodal method and loop current method based on Kirchhoff‘s laws.
1.5 Explain star and delta circuits.
1.6 Give the formulae for star- delta and delta – star transformations.
1.7 Solve simple problems on star- delta and delta– star transformations.
1.8 Define ideal voltage source & ideal current source.
1.9 Convert ideal voltage source to ideal current source.
1.10 Convert ideal current source to ideal voltage source.
1.11 State super position, Thevenin‘s ,Norton‘s, maximum power transfer theorems (D.C circuits only & No Problems)

2.0 Single phase A.C. circuits

2.1 Define the term phase and phase difference.
2.2 Derive the relationship between voltage and current in pure resistive, Inductive and capacitive circuits.
2.3 Draw the phasor diagrams and wave forms of pure resistive, inductive and capacitive circuits.

	2.4 Write the equation for impedance, current, phase angle, power and Power factor in R-L, R-C, & R-L-C. Series circuits. 2.5 Draw the phasor diagrams and wave forms of R-L, R-C, & R-L-C Series circuits. 2.6 Solve simple Problems on Series Circuits. 2.7 Solve problems on parallel circuits by a) Vector method b) Admittance method and c) 'J' notation method 2.8 Define resonance in series and parallel electric circuits. 2.9 Differentiate between series resonant circuit and parallel resonant circuit. 2.10 Derive the equation for resonant frequency in series RLC circuit. 2.11 Derive the equation for resonant frequency in parallel RL-C circuit. 2.12 Define `Q'factor. Mention the importance of Q factor. 2.13 solve simple problems on resonance and Q factor. **3.0 Heating effects of Electric Current** 3.1 State Mechanical equivalent of heat. 3.2 State the heat produced due to flow of current. 3.3 List the practical applications of heat produced due to Electric current in Metal. 3.4 Explain the construction and working of following practical applications of heat produced due to Electric current in metal: a) Filament lamps b) Electric kettle c) Electric cooker d) Electric Iron e) Space heaters f) Geyser g) Infrared lamp. 1.5 Define Thermal efficiency. **4.0 Transformers** 4.1 Explain the working principle of a Transformer 4.2 Explain the construction of transformers (core type, shell type). 4.3 Give reasons for using laminations in transformer core 4.4 Derive the EMF equation of transformer. 4.5 Solve simple problems on EMF equation of transformer. 4.6 State the voltage transformation ratio. 4.7 Define efficiency and regulation of transformer. 4.8 State the losses in a transformer. 4.9 Explain the working of Auto transformer and list their

	advantages. 4.10 Explain the working of Current transformer and Potential transformer with diagram. 4.11 Explain the use of transformer as : a) Impedance matching transformer b) Isolation transformer 4.12 State the need for cooling of a transformer. 4.13 List the cooling methods of a transformer. 4.14 List important specifications of a transformer. **5.0 DC machines & AC Machines** 5.1 Explain the working of simple loop generator. 5.2 State Flemings right hand rule. 5.3 Explain the construction of D.C. Generator. 5.4 Write the expression for E.M.F. equation of a D.C.generator (no derivation). 5.5 Classify D.C. Machines with reference to excitation. 5.6 Define armature reaction and state their effects. 5.7 Define commutation and state the methods to improve commutation 5.8 List different losses in D.C. Machines. 5.9 Draw and explain power flow diagram in a D.C. generator. 5.10 Define efficiency of a D.C. generator. 5.11 State Flemings left hand rule. 5.12 Explain the working principle of D.C. Motors. 5.13 State the significance of back e.m.f. and give formula in terms of supply voltage, Armature current and Resistance, and also in terms of ø, Z, N,P, A. 5.14 Write the expression for Torque Equation (No derivation) 5.15 Explain the principle of alternator. 5.16 Explain the constructional features of alternator. i) Salient pole ii) Non salient pole or smooth cylindrical type. 5.17 Write the EMF equation of an alternator (No – Derivation).

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-106.1	1	1						3	2	1
AEI-106.2	1	1			1			3	2	1
AEI-106.3	1	1						3	2	1
AEI-106.4	1	1						3	2	1
AEI-106.5	1	1						3	2	1
Average	**1**	**1**			**1**			**3**	**2**	**1**

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENTS

1.**DC Circuits and Network Theorems:**
Junction, branch and loop in circuits- Kirchhoff's laws - Star - Delta configurations, Concept of transformation - Ideal Voltage , Ideal current source - Super position theorem, Thevenin's Theorem - Norton's Theorem, Maximum power transfer theorem with reference to D.C.

2.**Single phase A.C. Circuits:**
Voltage and current relationship in pure resistive,Inductive and capacitive circuits- R-L, R-C ,R-L-C series circuits – Equations for voltage, current, impedance, power and power factor -Problems on series circuits – Problems on Parallel circuits by vector method, admittance method and by `J' notation method - Resonance - Definition of resonance–Series and parallel resonant circuit-`Q' factor.

3. **Heating Effects of Electrical Current:**
Mechanical Equivalent of Heat - Heat produced due to flow of current in metal: Filament lamps, Electric kettle, Electric cooker, Electric Iron, Space heaters, Geyser, Infrared lamp-Thermal efficiency.

4. **Transformers:**
Principle of Transformer - Types and Constructional features of transformer- E.M.F equation of a transformer- Auto Transformer - Potential Transformer, Current transformer, Impedance matching transformer, Isolation transformer.

5. **DC & AC Machines:**
D.C. machines: Simple loop generator-Flemings right hand rule-Construction of D.C generator, E.M.F equation, classification of D.C machines on the basis of excitation,Armature reaction and commutation, Losses and efficiency,Flemings left hand rule,principle of D.C. motor,significance of back E.M.F, torque equation.

AC Machines: Principle and construction of alternator, types of alternator, e.m.f. equation of alternator.

REFERENCE BOOKS

1. B.L. Theraja - Electrical Technology - Vol – I& Vol-II ,
2. V.K.Mehtha - Introduction to Electrical Engg.,S. Chand.
3. Hughes - Electrical Technology, Pearson.
4. Parker Smith - Problems in Electrical Engg, Parker Smith.

BLUE PRINT

S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	D.C Circuits and Network Theorems	25	14	6	8			2	1			CO1
2	Single phase A.C. circuits	30	14	6	8			2	1			CO2
3	Heating Effects of Electrical Current	15	11	3	8			1	1			CO3
4	Transformers	25	17	9	8			3	1			CO4
5	DC & AC Machines	25	14	6	8			2	1			CO5
	Higher Order Question FROM CHAPTER 2		10				10				1	CO2
	Total	120	80	30	40	-	10	10	5	-	1	-

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 2.3
Unit Test-II	From 2.4 to 4.6
Unit Test-III	From 4.7 to 5.17

C-20-AEI-106

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- FIRST YEAR EXAMINATION
BASIC ELECTRICAL ENGINEERING

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 simplesentences.

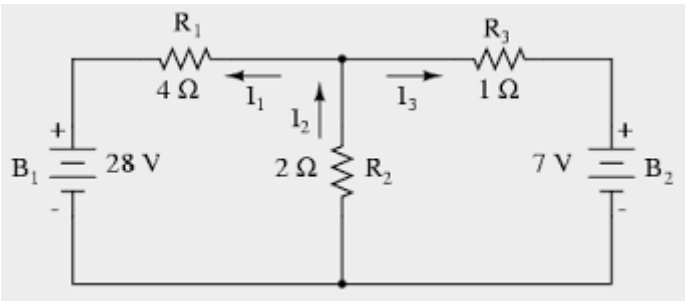
1. State Kirchhoff Current law. (CO1)
2. Define the term ideal voltage source. (CO1)
3. Define the term phase difference. (CO2)
4. Define the resonance in series electric circuits . (CO2)
5. Define the term Thermal efficiency (CO3)
6. Define the Efficiency of transformer (CO4)
7. State the relationship between voltage, current ratios and turn ratios. (CO4)
8. Give reasons for using laminations in transformer core (CO4)
9. Write the EMF equation of alternator. (CO5)
10. Define the term efficiency of DC Machines (CO5)

PART- B

5×8=40

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

11. (A).Calculate the current in each branch of the circuit shown in figure below using kirchoff"s laws. (CO1)



or

(B). State Superposition theorem and Norton theorem. (CO1)

12. (A). Derive the relationship between voltage and current in pure resistive,circuits. (CO2)

or

(B). Derive the equation for resonant frequency in series RLC circuit. (CO2)

13. (A). Explain the construction and working of electric cooker. (CO3)

Or

(B). Explain the construction and working of electric geyser. (CO3)

14. (A). Explain the working principle of transformer. (CO4)

Or

(B). Explain the working of current transformer and potential transformer. (CO4)

15. (A). Explain the construction of DC Machine. (CO5)

Or

(B). Explain the constructional features of Salient Pole alternator. (CO5)

PART- C

1×10=10

Instructions: (1) Answer the following question carries ten marks.

(2) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16.Analyse what would happen to the resonant frequency of a metal bar if it were made of a more elastic metal? What would happen to the resonant frequency if an extra amount of mass were added to the end being struck? (CO2)

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DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)
BASIC ELECTRICAL ENGINEERING (AEI-106)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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. i) In which law the incoming currents are equal to outgoing currents. (CO1) 4X1M=4M

   ii) Define ideal voltage source. (CO1)

   iii) Resistance is a passive element (True/False) (CO1)

   iv) Write the impedance equation of R-L series circuit (CO2)

2. Differentiate between active and passive circuits. (CO2) 3M

3. State super position theorem. (CO1) 3M

4. Define the term phase and phase difference. (CO2)3M

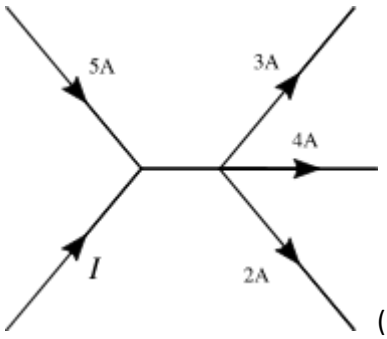
5. Draw the phasor diagram of pure capacitive circuit. (CO2)3M

PART- B

3×8M=24M

Instructions: Answer either (A) or (B) from each question and each question carries Eight marks.

6. (A).Calculate current 'I' as shown in the below figure by using kirchoff's current law



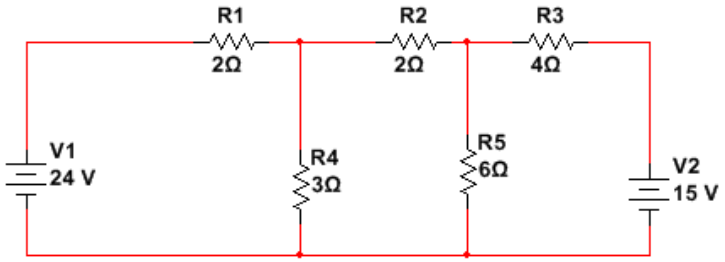
(CO1)

Or

(B). Convert the given Star values into Delta. (CO1)

i) 3Ω, 4Ω, 6Ω ii) 6Ω, 6Ω, 6Ω

7. (A). Find the loop currents for the circuit shown below using loop Analysis method. (CO1)



.

Or

(B). A coil has a resistance of 20Ω and an inductance of 15mH.If an AC supply of230V, 50Hz is applied across the coil.Find Impedance, current, phase angle, power factor and power. (CO1)

8.(A). Derive the relationship between voltage and current in pure resistive circuits(CO2)

Or

(B). Derive the relationship between voltage and current in pure inductive circuits (CO2)

***

ENGINEERING DRAWING

Subject Title	Subject Code	Periods/Week	Periods Per Year
Engineering Drawing	**AEI–107**	**06**	**180**

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	No. Of Periods	Marks to be awarded	Short Answer 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 Explainthe basic graphic skills and use them in preparation of engineering drawings, their reading and interpretation	
Course Outcomes	**CO1**	AEI-107.1	Practice the use of engineering drawing instruments
	CO2	AEI-107.2	Usethe conventions to be followed in engineering drawing as per BIS
	CO3	AEI-107.3	Construct the i) basic geometrical constructions ii) engineering curves
	CO4	AEI-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	AEI-107.5	Visualise and draw the isometric views of machine components
	CO6	AEI-107.6	Draw the developments of surfaces of regular solids and use them to make the components used in daily life

CO-PO/PSO MATRIX

	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 Explain 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 of Mechanical 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 Explain Dimensioning Practice

4.2 Acquaint with the conventions, notations, rules and methods of dimensioning in engineering drawing as per the B.I.S.

4.5 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.

8.4 Differentiate between true shape and apparent shape of section

8.5 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 meter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to Explain 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

Engineering Graphics by P I Varghese – (McGraw-hill)

Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)

Engineering Drawing by N.D.Bhatt.

T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.

SP-46-1998 – Bureau of Indian Standards.

C-20-AEI-107

BOARD DIPLOMA EXAMINATIONS
MODEL QUESTION PAPER
DAEIE – I-YEAR
ENGINEERING DRAWING

Instructions: **01.** **All the dimensions are in mm**
02. **Use first angle projections only**
03. **Due weitage will be given for the dimensioning and neatness**

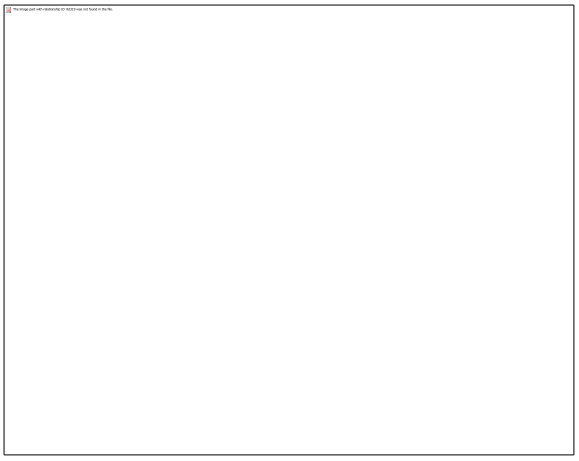
PART – A **05x 04=20**

01. **Answer all the questions**
02. **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.The distance 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**

Instructions: 01.Answer any FOUR of the following questions
02.Each question carries TEN marks

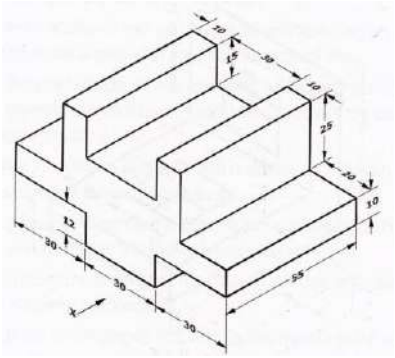
05. Draw the involute of a circle of diameter 30 mm and also draw a tangent to the curve at a distance of 60 mm from the centre of the circle.

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.

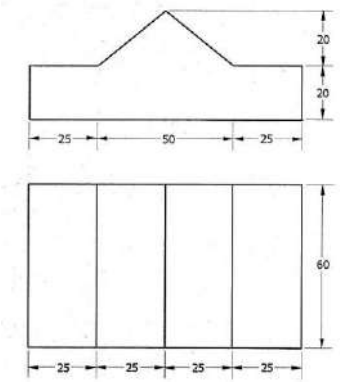
07. A regular hexagonal prism of height 80 mm and base side 40 mm is resting in the H.P. on its base. It is cut by an auxiliary inclined plane of 60^0 inclination passing through the axis at a distance of 30 mm from the top base. Draw the sectional views of the solid and the true section.

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



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ELECTRICAL WIRING AND ELECTRONIC COMPONENTS & DEVICES LAB

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-108	ELECTRICAL WIRING, ELECTRONIC COMPONENTS & DEVICES LABORATORY	6	180	40	60

S.NO	Major Topics	No. of Periods	COs Mapped
1	Wiring practice	35	CO1, CO6
2	Identification of components	30	CO2, CO6
3	Soldering Practice	40	CO3
4	Study and use of Electronic equipment	35	CO4, CO7
5	Testing of Electronic components, Devices and Rectifiers	40	CO5, CO7, CO8
	TOTAL	**180**	

Upon completion of the course the student shall be able to			
Course Objectives		(i) ii)	Useelectrical wiring, Soldering and Identification of components and equipments. UseStudy, Testing and use of different types of Electronic components and equipments.
Course outcomes	CO1	AEI-108.1	Familiarisation of various tools used in electrical wiring.
	CO2	AEI-108.2	Identification of components
	CO3	AEI-108.3	Practice on Soldering.
	CO4	AEI-108.4	Study and use of electronic equipment
	CO5	AEI-108.5	Testing of electronic components and Devices.
	CO6	AEI-108.6	Connection of tube light with function of choke, tube and starter, ceiling fan, microphones and loudspeaker.
	CO7	AEI-108.7	Measurement of the value of resistor, AC/DC Voltages and currents using voltmeters and current Meters, using analog and digital Multimeters.
	CO8	AEI-108.8	Draw forward and reverse bias characteristics of semiconductor diode, Zener diode, transistor in CB mode and in CE mode.

Learning Outcomes		**1.0. Wiring Practice:** 1.1. Familiarisation of various tools used in electrical wiring. 1.Wire stripper, 2. Insulation remover 3. Pocket knife 4.Electrical Tester 5.Phillips Head Screwdrivers 6. Mallet 7.Rawl plug jumper 8 .Standard wire Gauge 1.2. Identifying and working with Pliers a) Identify the various functions of cutting pliers, Nose pliers, Pipe pliers, Flush cutter,top cutting pliers, Electronics pliers, Insulated cutting pliers b) Perform the following operations: 1. Holding 2. Wire cutting 3. Component bending 4.Twisting the wire. 1.3. Identification of different wires and cables: a) Hookup wires a. PVC wire b. Teflon wires c.single strand d. multi strand. b) Wires used for electrical wiring: i) Service wire ii) TRS wires /PVC Wires (Al &Cu), iii) .single strand iv) Multi strand v) twisted Flexible pair wires vi) Enameled copper wire, Power cord. d) Cables: UTP cable , Co axial cables, Flat ribbon cable for antennas, Telephone cable, Ethernet cable, Ribbon cables, Optical fiber. 1.4. Wire joints practice: Perform the following wire joint operations: Twisting, Splicing, Insulating, Western union joint, Married joint, Britania (straight Joint), Tee joint, Joining running cables, Pigtail or rat tail joint. 1.5. Identifying the Electrical accessories: a) SPST Switch ,SPDT switch ,DPST switch, b) Two pin and Three pin Sockets and plugs, c) Power Socket and Power plugs, Lamp holders, Ceiling rose, d) Mains Switch, MCB, Kitkat Fuse – Fuse wire ratings. e) Usage of Fuse and variac 1.6. Identifying the mains supply Phase ,Neutral ,Ground: a) Identification of Phase and Neutral, Terminals in mains supply, b) Explainthe purpose of earthing, 2pin and 3pin Plug Connections. 1.7. Make simple switch connections using low voltage transformer a) Connecting a 6V lamp to a switch (toggle). b) 2 way switch connections. c) Series and parallel connection of lamps. 1.8. Simple staircase wiring – one lamp control with two switches. 1.9. Connection of tube light with function of choke, tube and starter. 1.10. Connection of ceiling fan and reversing the direction of ceiling fan. **2.0 Identification of components:** 2.1 Identify different types resistors with different wattage. 2.2 Identify different types of Inductors. 2.3 Identify colour coding of different resistors. 2.4 Find the value of a given Resistor using colour code. 2.5 Identify different types of switches and relays. 2.6 Identify microphones and loudspeaker connections. **3.0 Soldering**

		3.1 Familiarisation of various soldering tools, Components & different cables. 3.2 Assemble and disassemble components using soldering irons 3.3 Use different types of soldering irons. 3.4 Use solder squeezer on electronic PCBs. 3.5 Use instant soldering gun. 3.6 Solder on printed circuit boards using passive and active components. **4.0 Study and use of electronic equipment:** 4.1 Usethe symbols of electronic circuit components by drawing. 4.2 Measurement of AC/DC Voltages and currents using voltmeters and currentMeters. 4.3 Measurement of voltage, current and resistance using analog and digitalMultimeters. 4.4 Perform the continuity test for different components and devices using analog and Digitalmultimeters. 4.5 Study and use of AF / RF signal generators. 4.6 Study and use of C.R.O. (single trace & Dual trace) for measuring frequency andamplitude. 4.7 Study and use of single channel and dual channel regulated power supply units. **5.0 Testing of electronic components, Devices and Rectifiers:** 5.1 Measure the value of resistor using ohmmeter / multimeter and compare with the colour code value. 5.2 Test and measure the value of capacitor using R.L.C. meter and compare with the marked / colour code value. 5.3 Test the given loud speaker and measure the voice coil resistance-using multimeter. 5.4 Test the working of different types of switches, relays. 5.5 Arrange the Public Address system and test the performance. 5.6 Identify leads and testing of different diodes (PN Junction Diode, Zener Diode) and transistors using Multimeter. 5.7 Study of data manuals/ application manuals for diodes and transistors. 5.8 Draw forward and reverse bias characteristics of semiconductor diode and calculate forward and reverse resistance of diode. 5.9 Draw reverse bias characteristics of Zener diode and find out the zener voltage. 5.10 Draw input and output characteristics of transistor in CB mode. 5.11 Draw input and output characteristics of transistor in CE mode. 5.12 Implement Half wave rectifier with and without filter. 5.13 Implement Full wave rectifier with and without filter. 5.14 Implement Bridge rectifier with and without filter.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-108.1	1	1			1			3	2	1
AEI-108.2	1	1			1			3	2	1
AEI-108.3	1	1			1			3	2	1
AEI-108.4	1	1			1			3	2	1
AEI-108.5	1	1			1			3	2	1
AEI-108.6	1	1			1			3	2	1
AEI-108.7	1	1			1			3	2	1
AEI-108.8	1	1			1			3	2	1
Average	**1**	**1**			**1**			**3**	**2**	**1**

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

Reference Lab Manual:

1. Electronic Devices and Circuits by David A Bell 4 Edition PHI

2. Hand soldering and circuit board repair by H.(Ted)Smith, Thomas Delmar.

3. Electronic instruments and systems – principles, maintenance and troubleshooting. by R.G. Gupta.

PHYSICS LAB PRACTICE
(C-20 CURRIUCULUM COMMON TO ALL BRANCHES)

Subject Code	Subject Title	Periods per week	Total periods per year
AEI-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 $l\text{-}T^2$ graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and $l\text{-}T^2$ 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
AEI-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**
POs	**Mapped with CO No**	**CO periods addressing PO in Col 1 NO**	**%**	**Level 1,2,3**	**remarks**
PO1	CO1,CO2,CO3, CO4,CO5	12	26.66	2	>40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed)
PO2	CO1,CO2,CO3, CO4,CO5	9	20	1	
PO3					
PO4	CO1,CO2,CO3, CO4,CO5	12	26.66	2	
PO5	CO2,CO3, CO4,CO5	12	26.66	2	
PO6					
PO7					

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.ofPeriods	Mapped with COs
1.	a) Recognition of chemical substances and solutions used in the laboratory by senses. b) Familiarization of methods for Volumetricanalysis	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'sSalt

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 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	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
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)		
Determination of pH using pH meter (03)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions /	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with

Determination of conductivity of water and adjusting ionic strength to required level (03)	buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Determination of turbidity of water (03)		
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
AEI-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	AEI-110.1	Identify hardware and software components
	CO2	AEI-110.2	Prepare documents with given specifications using word processing software
	CO3	AEI-110.3	Use Spread sheet software to make calculation and to draw various graphs / charts.
	CO4	AEI-110.4	Use Power point software to develop effective presentation for a given theme or topic.
	CO5	AEI-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
AEI-110.1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
AEI-110.2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
AEI-110.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
AEI-110.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
AEI-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 shadow 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	a. Format Text and paragraphs and use various text styles.

		d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	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 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	a. Insert table in the word document and edit b. Use sort option for arranging data.
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-	a. Familiarize with excel layout and use b. Use various features available

		Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	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	a. Setup Master slide and format b. Add notes

		f. The Slide Show Footer in PowerPoint g. Add Notes to a PowerPoint Presentation	
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	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files

		options e. Add narration to the slide f. Insert Hyperlinks	
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 e. Send the border color to the	Able to create a border or frame around an image to add visual interest to a photo

		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	Able to apply shadow emboss effects

		option→ drop shadow, inner shadow, bevel and emboss→ contour→ satin→ gradient overlay d. Save the image.	

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 8
Unit test-2	From 9 to 22
Unit test-3	From 23 to 40

I Year Internal Lab Examination

UNIT TEST - I

MODEL QUESTION PAPER

COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE: AEI-110**

MAX MARKS:40 **Time:90Min**

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. Identify the components on motherboard.
4. Perform the process of placing processor on CPU slot.
5. Perform the process of removing and placing the RAM in the corresponding slot.

6. Identify the CMOS battery and test whether it is working it or not.
7. Find details of following:

   a) Operating System being used.

   b) Processor name

   c) RAM

   d) Hard disk
8. Create a folder by your name, search a file or folder and find its path.
9. Draw the National Flag using MS Paint.
10. Create a word document that contains TEN names of your classmates (boys-5 & girls-5) and perform the following tasks:

    a) Save the document to your desktop.

    b) Sort the names in each list alphabetically.

    c) Set line spacing to 1.15.

    d) Use bullet points for the names in both lists separately.

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I Year Internal Lab Examination
UNIT TEST - II
MODEL QUESTION PAPER
COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE:AEI-110**
MAX MARKS:40 **Time:90Min**

1. Write individually addressed letters to your friends about the Republic Day celebration using Mail Merge.
2. Create a Word document about your college and insert page numbers in footer and College Name in header.
3. Create your class time table using Tables in MS Word.
4. Create a 2-page document about your College& insert hyperlinks for courses offered in the college and insert Bookmarks next to College Name.
5. Write individually addressed letters to your friends (at least 5 members) to intimate the External Examination time table using Mail Merge.
6. Write an equation $\frac{(x+y)^2}{(x-y)^2} = \frac{x^2+2xy+y^2}{x^2-2xy+y^2}$ in MS word.
7. Create the organizational structure of your college in MS Word.
8. Create a spreadsheet by totaling marks of 3 or more subjects, then calculate percentage and hence find grade based on boundary conditions of FIVE students:
   Grades O >= 90%, A >=80%, B >=70%, C >=60%, D >=50%, E >=40%, F <40%
9. Create a Excel spreadsheet for the following data, making sure that the cell marked with Category (A1) is pasted in cell A1 in the spreadsheet and perform the questions below.

Category (A1)	Product Name	Quantity	Inventory	Price per Unit	Total Price
Office Supplies	Binder	2	20	12.99	25.98
Office Supplies	Pencil	20	20	0.99	
Electronics	Samsung 4K Smart TV	1	5	399.00	
Electronics	Bluetooth Speakers	4	5	44.49	
Computers	Lenovo X230 12in Laptop	2	2	279.90	

   a) Change the format of the “Total Price” column to “Currency” format.
   b) Calculate Total Price by writing formula.
   c) Turn on filtering for the table.
   d) Sort the table by column “Category” from A to Z.
10. Create a spreadsheet to calculate Cumulative monthly attendance for a period of Three months.

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Year Internal Lab Examination

UNIT TEST - III

MODEL QUESTION PAPER

COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE: AEI-110**

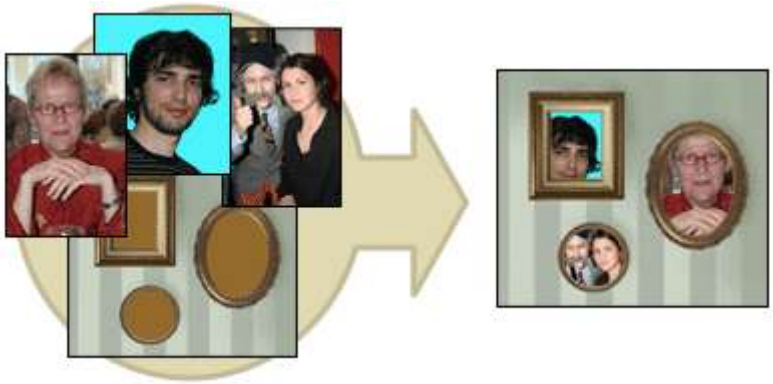
MAX MARKS:40 **Time:90Min**

1. Create a PowerPoint Presentation about your College in 5 slides only.
2. Create a PowerPoint Presentation on Computer Hardware in minimum 5 slides.
3. Create a PowerPoint Presentation on Computer Fundamentals with *Entrance, Emphasis* effects in minimum 5 slides.
4. Create a PowerPoint Presentation on any topic with special animation effects like *Entrance, Motion Paths &Exit.*
5. Resize the image using Photoshop.
6. Change the background of a Photograph.
7. Edit an image by using

   a) Crop tool.

   b) Resize the image

   c) Save the new image with new name keeping original image as it is.
8. A Picture of two parrots (parrots.jpg) is given to you. Make anyone of one of the parrots in Black & White.
9. Convert a colour image to monochrome and improve quality of photograph.
10. Copy three pictures and fit into the empty frames.



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BOARD DIPLOMA EXAMINATIONS
DIPLOMA IN COMPUTER ENGINEERING
MODEL PRACTICAL QUESTION PAPER-YEAR END EXAM
COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE:AEI-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.

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III SEMESTER

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

III SEMESTER

Subject Code	Name of the Subject	Instruction period / week		Total Periods /semester	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
AEI-301	Mathematics – II	4	-	60	3	20	80	100
AEI-302	Electronic circuits	4		60	3	20	80	100
AEI-303	Digital Electronics	5		75	3	20	80	100
AEI-304	Electronic Measuring Instruments	4		60	3	20	80	100
AEI-305	Process Instrumentation	5		75	3	20	80	100
AEI-306	Programming in C	5		75	3	20	80	100
PRACTICAL								
AEI-307	Electronic circuits Lab		3	45	3	40	60	100
AEI-308	Digital Electronics Lab		3	45	3	40	60	100
AEI-309	Electronic Measuring Instruments Lab		3	45	3	40	60	100
AEI-310	Process Instrumentation Lab		3	45	3	40	60	100
AEI-311	Programming In C and MATLAB		3	45	3	40	60	100
TOTAL		**27**	**15**	**630**	**-**	**320**	**780**	**1100**

ENGINEERING MATHEMATICS-II

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
AEI-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 Explainthe concepts of indefinite integrals and definite integrals with applications to engineering problems.
	(ii)	To Explainthe 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 *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. Evaluateintegrals of suitable powers of *tan x* and *sec x*.

1.8. Evaluate the Standard integrals of the functions of the type

$$i)\ \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}}$$

$$iii)\ \sqrt{x^2 - a^2}, \sqrt{x^2 + a^2}, \sqrt{a^2 - x^2}$$

1.9. Evaluate the integrals of the type

$$\int \frac{1}{a + bSin\theta} d\theta, \int \frac{1}{a + b\cos\theta} d\theta \text{ and } \int \frac{1}{a\cos\theta + b\sin\theta + c} d\theta .$$

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 $\int u.v dx$.

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.

3.4Solve 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 Explainthe 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
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	addressed
PSO 2	CO1, CO2, CO3	40	66.6%	3	
PSO 3	CO1, CO2, CO3	48	75%	3	5% to 25% Level 1 Low addressed <5% Not addressed

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 $\int \sin^m x.\cos^n x\,dx$, 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:

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

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.

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S. No	Chapter/Unit title	No of Periods	Weightageallotted	Marks wise distribution of weightage				Questionwise distributionof weightage				COs mapped
				R	U	Ap	An	R	U	Ap	An	
1	**Unit – I: Indefinite Integration**	22	28	11	11	06	0	2	2	2	0	**CO1**
2	**Unit – II: Definite Integration and its applications**	24	33	11	03	11	08	2	1	2	1	**CO2**
3	**Unit – III: Differential Equations of first order**	14	19	03	03	03	10	1	1	1	1	**CO3**
Total		**60**	**80**	**25**	**17**	**20**	**18**	**5**	**4**	**5**	**2**	

R: Remembering Type : 25 Marks

U: understanding Type : 17 Marks

Ap: Application Type : 20 Marks

An: Analysing Type : 18 Marks

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	FromL.O 2.6 to L.O 3.9

UNIT TEST MODEL PAPERS

Unit Test I **C –20, AEI-301**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-II**

Sub Code: **AEI-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 $\int x^8 dx$ (CO1)

   Evaluate $\int \frac{1}{\sqrt{4-x^2}} dx.$ (CO1)

   $\int e^x \left(f(x) + f'(x) \right) dx = e^x f(x) + c$ is true/false (CO1)

   a. Evaluate $\int_0^{\frac{\pi}{2}} \cos x dx$ (CO2)

2. Evaluate $\int \left(3\cos ec^2 x - 2\tan x \sec x + \frac{1}{x} \right) dx.$ (CO1)

3. Evaluate $\int \frac{\sin(\log x)}{x} dx.$ (CO1)

4. Evaluate $\int e^x \sin 2x dx.$ (CO1)

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) Evaluate $\int \frac{1}{5+4\cos x} dx.$ (CO1)

or

B) Evaluate $\int \sin^4 x \cos^3 x dx.$ (CO1)

7. A) Evaluate $\int \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) dx.$ (CO1)

or

B) Evaluate $\int x^4 e^{2x} dx.$ (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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Unit Test II **C –20, AEI-301**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-II**

Sub Code: **AEI-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 $y = f(x)$ over the interval $[a,b]$ when rotated about X-axis is

   _____ (CO2)

   b. Mean value of $f(x)$ over the interval $[a,b]$ is_____ (CO2)

   c. Order of differential equation $\frac{d^2y}{dx^2} + p^2y = 0$ is_____ (CO3)

   d. Integrating factor of $\frac{dy}{dx} + Py = Q$ is_____ (CO3)

2. Find the mean value of $x^2 + 2x + 1$ over the interval $[1,2]$ (CO2)

3. Find the area enclosed by curve $x^2 = 4y$ between the lines $x = 2$ and $x = 4$ (CO2)

4. Form the differential equation by eliminating the arbitrary constants from

   $y = A\cos 2x + B\sin 2x.$ (CO3)

5. Solve $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}.$ (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 $y = x^2 - 5x$ and the line $y = 4 - 2x$ (CO2)

Or

B) Find the R.M.S value of $\sqrt{\log x}$ between the lines $x = e$ to $x = e^2$ (CO2)

7. A) Find the volume of the solid obtained by revolving the ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ about x axis (CO2)

or

B) Calculate the approximate value of $\int_0^6 \frac{1}{1+x}\,dx$ by taking $n = 6$ using Trapezoidal rule (CO3)

8. A) Solve $\left(y^2 - 2xy\right)dx + \left(2xy + x^2\right)dy = 0.$ (CO3)

or

B) Solve $x\frac{dy}{dx} + \frac{y}{x} = x^3y^6.$ (CO3)

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END EXAM MODEL PAPERS

STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS AEI-301

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

PART-A

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

1. Evaluate $\int\left(2\sin x-3e^{x}+\frac{4}{1+x^{2}}\right)dx.$ **CO1**
2. Evaluate $\int e^{x}\sin e^{x}dx.$ **CO1**
3. Evaluate $\int \sin 3x\cos 2xdx.$ **CO1**
4. Evaluate $\int xe^{x}dx.$ **CO1**
5. Evaluate $\int_{0}^{1}\frac{1}{1+x^{2}}dx.$ **CO2**
6. Find the mean value of $y=x^{2}$ from $x=0$ to $x=1$ **CO2**
7. Find the area of the region bounded by the curve $y=\sin x$ from $x=0$ to $x=\pi$ **CO2**
8. Find the order and degree of the differential equation $\left(\frac{d^{3}y}{dx^{3}}\right)^{2}-3\left(\frac{dy}{dx}\right)^{2}-x^{2}=1$ **CO3**
9. Solve $\frac{dy}{dx}=\frac{1+y^{2}}{1+x^{2}}$ **CO3**
10. Solve $\left(x^{2}+y\right)dx+\left(y^{2}+x\right)dy=0.$ **CO3**

PART-B

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

11. A) Evaluate $\int \frac{3x+1}{(x-1)(x+3)}dx.$ **CO1**

Or

B) Evaluate $\int \frac{1}{5+4\cos x}dx.$ **CO1**

12. A) Evaluate $\int x\sin 3xcosxdx.$ **CO1**

Or

B) Evaluate $\int x^3\cos xdx.$ **CO1**

13. 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**

14. A) Find the area of the region bounded by the curves $y^2=4x$ **and** $x^2=4y$. **CO2**

Or

B) Find the R.M.S values of $\sqrt{27-4x^2}$ from $x=0$ to $x=3$ **CO2**

15. A) Find the volume of the solid generated by revolution of the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ about X-axis **CO2**

Or

B) Calculate the approximate value of $\int_1^{11} x^3dx$ 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 $2\sin x\frac{dy}{dx}-y\cos x=xy^3e^x.$ **CO3**

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STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS AEI - 301

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

PART-A

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

1. Evaluate $\int\left(3e^{x}-2\cos x+\frac{3}{x}\right)dx.$ **CO1**

2. Evaluate $\int\cos^{2}2xdx.$ **CO1**

3. Evaluate $\int\frac{\tan^{-1}x}{1+x^{2}}dx.$ **CO1**

4. Evaluate $\int x\cos xdx.$ **CO1**

5. Evaluate $\int_{0}^{2}\frac{1}{\sqrt{4-x^{2}}}dx.$ **CO2**

6. Find the mean value of $i=a\sin t$ over the complete wave. **CO2**

7. Find the volume generated by revolving the circle $x^{2}+y^{2}=9$ from $x=0$ to $x=2$ about x-axis **CO2**

8. Obtain the differential equation by eliminating the arbitrary constants A and B from the curve $y=Ae^{x}+Be^{-x}$ **CO3**

9. Solve $\frac{dy}{dx}=e^{2x+y}$ **CO3**

10. Solve $\frac{dy}{dx}+\frac{y}{x}=x$ **CO3**

PART-B

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

11. A) Evaluate $\int \frac{1}{2x^2+3x+5}dx.$ **CO1**

Or

B) Evaluate $\int \sin^3 x\cos^5 x dx.$ **CO1**

12. A) Evaluate $\int e^x\left(\frac{2+\sin 2x}{1+\cos 2x}\right)dx.$ **CO1**

Or

B) Evaluate $\int e^{2x}x^4 dx.$ **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) Find the area bounded between the curves $y=x^2$ and the line $y=3x+4$. **CO3**

Or

B) Find the R.M.S value of $\sqrt{\log x}$ between the lines $x=e$ to $x=e^2$ **CO2**

15. A) Find the volume of right circular cone using integration. **CO2**

Or

B) Find the approximate value of π from $\int_0^1 \frac{1}{1+x^2}dx$ using Trapezoidal rule by dividing $[0,1]$ into 5 equal sub-intervals. **CO2**

PART-C

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

16. Solve $xy^2dy-(x^3+y^3)dx=0$ **CO3**

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ELECTRONIC CIRCUITS

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-302	ELECTRONIC CIRCUITS	04	60	20	80

S No	Chapter/ Unit Title	No. of Periods	COs Mapped
1	FET, MOSFET	09	**CO1**
2	Transistor biasing and stabilization	11	**CO2**
3	Small Signal Amplifiers	8	**CO3**
4	Feedback amplifiers& Power Amplifiers	10	**CO4**
5	Oscillators	10	**CO5**
6	Sweep circuits & Multivibrators	12	**CO6**
	TOTAL	60	

Upon completion of the course the student will be able to:

Course Objectives	1. Explainthe operation of FET, and MOSFET.
	2. Use various transistor biasing and stabilization circuits.
	3. Explain different small signal, and large signal amplifiers.
	4. Explain different feedback amplifiers and oscillators.
	5.Explaindifferent sweep circuits and multivibrators.

Course Outcomes	**CO1**	AEI-302.1	Explain the working of FET and MOSFET.
	CO2	AEI-302.2	Explain transistor biasing and stabilizing techniques
	CO3	AEI-302.3	Explain the working of small signal amplifiers
	CO4	AEI-302.4	Analyze power amplifiers and feedback amplifiers
	CO5	AEI-302.5	Analyse the various oscillator circuits
	CO6	AEI-302.6	Explain various sweep circuits and multivibrators

LEARNING OUTCOMES:

1.0 **Explainthe construction and working of FET, andMOSFET's.**

1.1 Classify FETs.

1.2 List the advantages of JFET over BJT.

1.3 Draw the symbols of P-channel and N-channel JFET.

1.4 Explain the construction and working of N-channel JFET.

1.5 Draw the drain and transfer characteristics of N-channel JFET.

1.6 List the applications of FET.

1.7 List the types of MOSFETs.

1.8 Explain the construction and principle of operation of N- channel depletion and Enhancement type MOSFETs.

1.9 Explain the construction and principle of operation of CMOSFET.

2.0 Transistor biasing and stabilization

2.1 Explain the transistor as an amplifier in CB, CE and CC modes.

2.2 State,why CE Mode is widely used in amplifier circuits.

2.3 Define DC load line and AC load line.

2.4 Determine the Q- point (operating point) on the DC load line.

2.5 Define transistor biasing.

2.6 State the need for proper biasing in amplifier circuits.

2.7 List the types of biasing circuits.

2.8 Explain potential divider method of biasing.

2.9 Define the term stabilization.

2.10 State the need for stabilization in amplifier circuits.

2.11 Define stability factors S, S_V and S_β.

2.12 List the compensation techniques.

2.13 Explain Diode and Thermistor compensation techniques.

3.0Small signal Amplifiers

3.1 Classify the amplifiers based on frequency, period of conduction, and coupling.

3.2 State the need of multistage amplifier (Cascading of amplifiers).

3.3 List the types of couplings used in amplifiers.

3.4Explain the principle of operation of two-stage RC coupled amplifier with circuit diagram and draw its frequency response.

3.5Explain the principle of operation of two-stage transformer coupled amplifier with circuit diagram and draw its frequency response.

3.6Draw and explain the circuit of Direct Coupled Amplifiers.

3.7Compare RC coupling, transformer coupling and Direct Coupling schemes used in amplifiers.

4.0Feedback Amplifiers and power amplifiers

4.1 Compare Negative and Positive feedbacks.

4.2 Explain the principle of negative feedback in amplifiers.

4.3 Classify negative feedback amplifiers.

4.4 Draw and explain the following block diagram arrangements, of negative feedback amplifiers.

(a)Voltage –Series (b) Voltage –Shunt (c) Current- Series (d) Current - Shunt

4.5 Draw and Explain the Emitter follower circuit and mention its advantages.

4.6 Draw and Explain the working of Darlington amplifier circuit.

4.7 Distinguish between voltage amplifiers and power amplifiers.

4.8 Classify power amplifier circuits on the basis of frequency, period of conduction, and configurations.

4.9 Draw and explain the circuit of Push Pull Amplifier.

4.10 List the advantages of push-pull amplifiers.

4.11 List the applications of power amplifier.

4.12 State the necessity of Heat sink for a power transistor and power I.C. device.

4.13 List the different types of heat sinks.

5.0Oscillators

5.1List the Barkhausen Criterion conditions for an amplifier to work as an oscillator.

5.2List the essentials of an oscillator.

5.3Classify oscillator circuits.

5.4Draw and explain the working of an RC phase shift and Wein bridge oscillator circuits.

5.5State the conditions of sustained oscillations and derive the expression for the frequency of oscillations of RC phase shift oscillator and Wein bridge oscillator circuits.

5.6Draw and explain the working of Hartley, and Colpitts oscillator circuits.

5.7Draw and explain the working of Crystal oscillator circuit.

5.8Write the expressions for frequency of oscillation and mention the conditions for sustained oscillations of Hartley, Colpitts, and Crystal oscillator circuits.

5.9List the advantages of crystal oscillators over other types.

5.10 State the reasons for instability in oscillator circuits.
5.11 Suggest the remedies for instability in oscillator.
5.12 List the applications of oscillators.

6.0Sweep circuits and Multivibrators

6.1Define Sweep Voltage.
6.2State the fundamental consideration of sweep waveform.
6.3Distinguish between voltage and current time-base generators.
6.4Explain how transistor works as a switch, in CE mode.
6.5Draw and explain the Bootstrap sweep circuit.
6.6Draw and explain Miller's sweep circuit using transistor.
6.7Draw current sweep circuit using transistor and explain its working with waveform.
6.8Classify Multivibrators.
6.9Draw and explain the working of Transistorised Astable, Bistable and Monostable multivibrators with waveforms.
6.10 Draw and explain the working of Schmitt trigger circuit using transistor with waveforms.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-302.1	1	1						3	2	
AEI-302.2	1	1	1	1				3	2	
AEI-302.3	1	1		1				3	2	
AEI-302.4	1	1		1				3	2	
AEI-302.5	1	1						3	2	
AEI-302.6	1	1						3	2	
Average	**1**	**1**	**1**	**1**	**1**			**3**	**2**	

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENT:

1.0 FET,MOSFET**:** FET- construction and working, characteristics, applications.
MOSFET – types, construction and working, applications.

2.0 Transistor Biasing & Stabilization: Transistor as an amplifier, operating point, DC load line, Biasing- types of biasing, potential divider biasing, Stabilization, stability factors, Compensation techniques.

3.0 Small Signal Amplifiers: Classification of amplifiers, working and frequencyresponse of two- stage RC coupled ,transformer coupled amplifiers, and Direct coupled Amplifier .

4.0 Feedback Amplifers & Power Amplifiers: Feedback Amplifers- negative andpositive feedback. Classification of negative feedback amplifiers, Darlingtonamplifier, Emitter follower. Power Amplifiers- push-pull Amplifier, Comparisonof voltage and power amplifiers, Applications of power amplifiers. Necessity of a heat sink-Types of heat sink.

5.0 Oscillators: Barkhausen criterion conditions, Classification of oscillators, RC oscillators - RC phase shift oscillator and Wein bridge oscillator. LC Oscillators -Hartley and Colpitts oscillators. Crystal Oscillator working, advantages of crystaloscillator. Reasons and remedies for instability in oscillator circuits. Applications ofoscillators.

6.0 Sweep circuits &Multivibrators: Sweep circuits **-** Time base generators, Bootstrap sweep circuit, Miller sweep circuit, Current sweep circuit. Multivibrators-Classification of multivibrators, TransistorisedAstable, monostable and bistablemultivibrators with waveforms. Schmitt trigger using transistor - operation andwaveforms.

REFERENCE BOOKS:

1. G.K.Mithal - Electronic Devices and Circuits, S.Chand.
2. David A.Bell - Electronic Devices and Circuits 4th edition, PHI .
3. T.F. Bogart Jr, J.S.Beasley and G.Rico - Electronic Devices and Circuits , Pearson Education,6th edition, 2004.
4. Albert Malvino. – J Bates - Electronic Principles 7th edition, Tata McGraw-Hill Education. (TMH) Publishers.
5. V.K. Mehta - Principles of Electronics, S Chand & Company, 2008.
6. A.P.Godse - Electronic Devices and Circuits, S.Chand.
7. Milliman and Halkies - Integrated electronics, MGH.

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Sl 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	FET,MOSFET	10	14	6	8			2	1			**CO1**
2	Transistor Biasing and Stabilization	10	14	6		8		2		1		**CO2**
3	Small Signal Amplifiers	8	11	3		8		1		1		**CO3**
4	Feedback amplifiers& Power amplifiers	10	14	6	8			2	1			**CO4**
5	Oscillators	10	14	6		8		2		1		**CO5**
6	Sweep circuits and Multivibrators	12	03	3				1		-		**CO6**
	Higher Order Question from chapter 5		10				10			1		**CO5**
Total		60	80	30	16	24	10	10	2	4	-	-

Table specifying 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 6.10

BOARD DIPLOMA EXAMNATIONS (C-20)

DAEIE – III SEMESTER EXAMINATION

ELECTRONIC CIRCUITS (AEI-302)

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

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. List the types of MOSFETs. (CO1)
2. List the advantages of JFET over BJT. (CO1)
3. Why CE Mode is widely used in Amplifier Circuits. (CO2)
4. State the necessity of stabilization in amplifier in amplifier circuits. (CO2)
5. List the types of couplings. (CO3)
6. List any three advantages of Push pull amplifier. (CO4)
7. List the different types of heat sinks. (CO4)
8. List any three reasons for instability in oscillator circuits. (CO5)
9. State the merits of crystal oscillator over other oscillators. (CO5)
10. Define Sweep Voltage. (CO6)

PART- B

Instructions: 1) Answer either (A) or (B) from each question, 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. 5x8=40 M

11. (A). Explain the construction and working of N-channel JFET. (CO1)

or

(B). Explain the construction and principle of operation of CMOS FET. (CO1)

12. (A). Explain potential divider method of biasing. (CO2)

or

(B). Determine the Q-point on the DC load line. (CO2)

13. (A). Explain the principle of operation of two stage Transformer coupled amplifier and draw its frequency response . (CO3)

Or

(B) Explain the two stage RC Coupled Amplifier with circuit diagram and draw its frequency response. (CO3)

14. (A)Explain the following block diagram arrangements of negative feedback amplifiers with diagram.
(a)Voltage –Series (b) Current – Shunt (CO4)

or

(B). Explain the circuit of Push Pull Amplifier with diagram. (CO4)

15. a)Explain the working of RC phase shift oscillator circuit with diagram(CO5)

Or

b)Explain the working of Colpitts oscillator circuit with diagram(CO5)

PART- C 1×10=10

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

16Derive the expression for frequency of oscillations of Wein's bridge oscillator (CO5)

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DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)
ELECTRONIC CIRCUITS (AEI-302)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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. i)Draw the symbol of FET. (CO1) 4X1M=4M

ii) **Write the full form of MOSFET.** (CO1)

iii)**FET is a _____ controlled Device.** (CO1)

iv) A current ratio of I_C/I_E is usually less than one and is called ------ (CO2)

2 List the types of MOSFETs. (CO1) 3M

3. Define the term stabilization. (CO2) 3M

4. List the three types of couplings used in amplifiers. (CO3) 3M

5. List any three compensation techniques. (CO2)3M

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question and ,each question carries Eightmarks.

6. (A). Explain the construction and working of N-channel JFET. (CO1)

Or

(B). Explain the construction and principle of operation of Depletion mode MOSFET. (CO1)

7. (A). Explain Diode compensation technique. (CO2)

Or

(B). Explain potential divider method of biasing. (CO2)

8.(A). Explain the principle of operation of two-stage transformer coupled amplifier. (CO3)

Or

(B). Classify the amplifiers based on frequency, period of conduction, and coupling. (CO3)

***

DIGITAL ELECTRONICS

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-303	DIGITAL ELECTRONICS	5	75	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Basics of Digital Electronics	18	CO1
2	Combinational Logic circuits	16	CO2
3	Sequential Logic Circuits	19	CO3
4	Registers and Memories	12	CO4
5	A/D and D/A converters	10	CO5
	TOTAL	**75**	

Upon completion of the course the student shall be able to			
Course Objectives	(i) ii) iii) iv) v)	Usevarious number systems, postulates of Boolean algebra, logic gates. Acquaint with the combinational logic circuits. Acquaint with the Sequential logic circuits. Acquaint with the registers and memories. Acquaint with the A/D and D/A converters.	
Course outcomes	CO1	**AEI-303.1**	Convert a number from one system to another system, logic gates; simplify logic expressions using Boolean laws and K-map.
	CO2	**AEI-303.2**	Implement combinational logic circuits.
	CO3	**AEI-303.3**	Implement sequential logic circuits.
	CO4	**AEI-303.4**	Classify different registers, semiconductor memories.
	CO5	**AEI-303.5**	Explain the principle of operation of A/D and D/A convertors.

Learning Outcomes	**1.0 Explainthe basics of Digital Electronics** 1.1 Explain Binary, Octal, Hexadecimal number systems and compare with Decimal system. 1.2 Convert one number system to another of the above systems. 1.3 Perform binary addition, subtraction, Multiplication and Division. 1.4 Write 1‘s complement and 2‘s complement numbers for a given binary number. 1.5 Perform subtraction of binary numbers in 2‘s complement method. 1.6 Compare weighted and Un-weighted codes. 1.7 Write Binary equivalent number for number in 8421, Excess-3 and Gray code and vice-versa. 1.8 State the use of alphanumeric codes (ASCII & EBCDIC) . 1.9 State the importance of parity Bit. 1.10 List the types of parity bits. 1.11 State different postulates in Boolean algebra. 1.12 Write Boolean expressions for the given statement of the problem (Limited 3 variables only). 1.13 State De-Morgan‘s theorems. 1.14 Apply De-Morgan‘s theorems and other postulates to simple Boolean expressions. 1.15 Write Boolean expressions from the given truth table. 1.16 Use Karnaugh map to simplify Boolean Expression (up to 3 variables only). 1.17 Explain AND, OR, NOT operators with truth table. 1.18 Explain the working of an exclusive – OR gate with truth table. 1.19 Explain the working of NAND, NOR gates using truth tables. 1.20 Develop AND, OR, NOT operations using NAND, NOR gates. 1.21 List the numbers of two input Digital IC Logic gates. **2.0 Explainthe working of combinational logic circuits** 2.1 Define combinational logic circuit. 2.2 State the function of the Half-adder. 2.3 Draw Half adder circuit using Exclusive OR gate and an AND gate. 2.4 Realise a Half-adder using NAND gates only and NOR gates only. 2.5 State the function of the full-adder. 2.6 Draw full adder using basic gates. 2.7 Show that two Half-adders and an OR – gate constitutes a full-adder. 2.8 Draw a 4 Bit parallel adder using full – adders. 2.9 Explain the working of the above circuit. 2.10 Draw and Explain 2‘s compliment parallel adder/ subtractor circuit. 2.11 Explain the working of a serial adder with a Block diagram. 2.12 Distinguish between serial and parallel adder. 2.13 Draw and explain the operation 4 X 1 Multiplexer 2.14 Draw and explain the operation 1 X 4 De-multiplexer 2.15 Draw and explain 2 X 4 and 3 X 8 decoders. 2.16 List the applications of Multiplexer and decoder. 2.17 Explain the working of 4 X 2 encoder. 2.18 Draw and explain one-bit digital comparator.

	3.0 Explainthe working of Sequential logic circuits 3.1 Define Sequential logic circuit. 3.2 Distinguish between synchronous and asynchronous sequential logic circuits. 3.3 Construct SR flip flop using NAND gates and explain its operation. 3.4 Explain JK flip flop with the help of truth table. 3.5 State the need for preset and clear inputs. 3.6 State the race around condition. 3.7 List the conditions for eliminating the race around condition. 3.8 Explain JK Master Slave flip flop with truth table. 3.9 Explain the D flip flop and T flip-flop with the help of truth table and diagram. 3.10 Define counter. 3.11 Differentiate between synchronous and asynchronous counters. 3.12 Define Modulus of the Counter. 3.13 Explain asynchronous ripple counter (MOD-16) with the help of flip-flops and timing diagrams. 3.14 Explain asynchronous ripple counter (MOD-10 or Decade. counter) with the help of flip-flops and gates. 3.15 Explain synchronous ripple counter (MOD-16) with the help of flip-flops and gates. 3.16 Explain the working of Ring counter and list its applications. **4.0 Explainworking of Registers and memories** 4.1 Define the term Register. 4.2 State the need for a Register. 4.3 Explain the working of serial in Serial out, serial in Parallel out, Parallel in serial out and Parallel in parallel out Registers. 4.4 Explain the working of shift left and shift right Registers. 4.5 Explain the working of Universal shift register (74194 or equivalent) 4.6 List the applications of Register. 4.7 List various types of memories. 4.8 Differentiate between ROM and RAM. 4.9 Explain the principle of working of ROM. 4.10 State different types of ROM. 4.11 Explain the principle of working of RAM. 4.12 Compare static RAM and dynamic RAM. 4.13 List different ROM and RAM ICs. **5.0 A/D and D/A converters** 5.1 State the need for A/D converters. 5.2 State the need for D/A conversion. 5.3 Explain the basic principle of D/A conversion. 5.4 Define the terms resolution, Accuracy, Monotonicity and settling time of D/A converter. 5.5 Explain D/A conversion using weighted resistors. 5.6 Explain D/A conversion using R-2R ladder network. 5.7 Explain A/D conversion using counter method. 5.8 Explain A/D conversion using successive approximate method.

COURSE CONTENTS

1.0 Basics of Digital Electronics

Binary, Octal. Hexadecimal numbering systems. Conversion from one system to another number system. Binary codes, excess-3 and gray codes. Logic gates: AND, OR, NOT, NAND, NOR, Exclusive-OR. Boolean algebra, Boolean expressions.Demorgan's Theorems. Karnaugh map.

2.0 Combinational logic circuits

Half adder, Full adder, Serial and parallel Binary adder. Parallel adder, Multiplexer,Demultiplexer, decoder, encoder, Digital comparator

3.0 Sequential logic circuits

Principle of flip-flops operation, RS, D, JK, T, JK Master Slave flip-flops. Binarycounter, asynchronous ripple counter, decade counter., synchronous counter, RingCounter.

4.0 Registers and memories

Shift Registers- serial in Serial out, serial in Parallel out, Parallel in serial out andParallel in parallel out Registers. Universal shift registers-Applications.RAM, ROM,static RAM, dynamic RAM.

5.0 A/D and D/A Converters

Necessity of A/D and D/A converters.Weighted resistors and R-2R ladder method ofD/A converters.Counter and SAR method of A/D converters.

Reference Books

1RP JAIN - Modern Digital Electronics, TMH.

2. Tokhem - Digital Electronics, TMH.

3. Puri - Digital Electronics, TMH.

4. Bartee, Digital Computer Fundamentals, McGraw Hill Education India.

5. B. Somanathan Nair - Digital Electronics and logic design, PHI.

6.Malvino - Digital Computer Electronics , TMH.

7.M. Morris Mano - Digital logic and computer design, Pearson.

8. C.V.S. RAO - Switching theory and logic design, Pearson.

9. Samuel C.Lee - Digital circuits and logic design, Prentice Hall.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-303.1	1	1	1					3	2	
AEI-303.2	1	1	1					3	2	
AEI-303.3	2		2					3	2	
AEI-303.4	1		1	2				3	2	
AEI-303.5	1							3	2	
Average	**1.2**	**1**	**1.25**	**2**	**1**			**3**	**2**	**1**

3= Strongly mapped

2= Moderately mapped

1= Slightly mapped

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S. No	Major Topics	No. of period	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Basics of Digital Electronics	18	17	6	3	8		2	1	1		CO1
2	Combinational Logic circuits	16	17	9	8			3	1			CO2
3	Sequential Logic Circuits	19	14	6	8			2	1			CO3
4	Registers and Memories	12	11	3		8		1		1		CO4
5	A/D and D/A converters	10	11	3	8			1	1			CO5
	Higher order question from chapter 1 or 2 or 3		10			10				1		CO1,CO2,CO3
	Total	**75**	80	27	27	26	-	9	4	3	-	-

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 3.5
Unit Test-II	From 3.6 to 5.8

C-20-AEI-303

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- THIRDSEMESTER EXAMINATION
DIGITAL ELECTRONICS

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. State the importance of parity bits. (CO1)
2. State De-Morgan's theorem. (CO1)
3. Compare weighted and un weighted codes. (CO1)
4. List any three applications of Multiplexer. (CO2)
5. Draw the half adder circuit using basic gates. (CO2)
6. Sate the difference between serial and Parallel Adder (CO2)
7. Define the term "sequential logic circuit" (CO3)
8. Define the term "counter" (CO3)
9. List any three applications of a register. (CO4)
10. State the need for D/A converters . (CO5)

PART- B

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer. **5x8=40 M**

11. (A). Explain the working of exclusive OR gate and OR gates with truth tables . (CO1)
    or
    (B). Explain the working of NAND, NOR gate with truth table . (CO1)

12. (A). Explain 2's complement parallel adder /sub tractor circuit (CO2)
    or
    (B). Explain one bit digital comparator with diagram (CO2)

13. (A). Explain JK master/Slave flip-flop with truth table (CO3)

Or

(B). Explain the working of Ring counter (CO3)

14. (A). Explain the principle of working of ROM (CO4)

Or

(B). Explain the working of universal shift register (CO4)

15. (A). Explain D/A conversion using R-2R Ladder network (CO5)

Or

(B). Explain A/D conversion using successive approximation method (CO5)

PART- C

1×10=10

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

16. Design a synchronous ripple counter(MOD-16) with the help of flip-flop and gates.(CO3)

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)
DIGITAL ELECTRONICS (AEI-303)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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. i) $(1100)_2=(\text{----})_{10}$ (CO1) 4X1M=4M

ii) $(\text{----------})_2=(265)_8$ (CO2)

iii) Define sequential logic circuit. (CO1)

iv)Write the sum equation of the half adder. (CO2)

2. Compare weighted and unweghted codes in any three aspects. (CO1) 3M

3. State De-Morgan's theorem (CO1) 3M

4. Draw 4 Bit parallel adder using full – adders. (CO2) 3M

5. State the need for present and clear inputs (CO3) 3M

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question andeach question carries Eight marks.

6. (A). Explain the working of NAND, NOR gates using truth tables. (CO1)

or

(B). Explain the working of an exclusive – OR gate with truth table. (CO1)

7. (A). Explain the working of a serial adder with a Block diagram. (CO2)

Or

(B). Draw and explain the operation 4 X 1 Multiplexer. (CO2)

8. (A). Construct SR flip flop using NAND gates and explain its operation. (CO3)

or

(B). Show that two Half-adders and an OR – gate constitutes a full-adder. (CO2)

***

DAEIE- SECOND UNIT TEST
MODEL QUESTION PAPER(C-20)
DIGITAL ELECTRONICS (AEI-303)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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) i) Define counter (CO4) 4X1M=4M
ii) List various types of memories. (CO4)
iii) List the applications of Register. (CO4)
iv) Define the terms Accuracy of D/A converter. (CO5)
2. List different applications of Ring counter . (CO4) 3M
3. Draw the diagram of MOD-16 counter (CO4) 3M
4. State the need of a Register (CO4)3M
5Define the terms resolutionof D/A converter (CO5) 3M

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question and each question carries Eight marks.

6 (A). Explain JK Master Slave flip flop with truth table.

(or)

(B)Explain asynchronous ripple counter (MOD-10 or Decade. counter) with the help of flip-flops and gates.

7 (a)Explain the working of Universal shift register (74194 or equivalent)

(or)

(b)Explain the principle of working of RAM.

8 (a)Explain D/A conversion using weighted resistors.

(or)

(b)Explain A/D conversion using successive approximate method.

***

AEI-304 ELECTRONIC MEASURING INSTRUMENTS

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-304	**ELECTRONIC MEASURING INSTRUMENTS**	04	60	20	80

S. NO	Major Topics	No. of Periods	COs Mapped
1	Analog instruments	17	CO1
2	Digital instruments	11	CO2
3	Cathode Ray Oscilloscope	17	CO3
4	Signal generators	8	CO4
5	Test instruments	7	CO5
	TOTAL	60	

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Familiarize with Analog and digital instruments.
	(ii)	Explain the working of cathode ray oscilloscope.
	(iii)	Explain the working of signal generators.
	(iv)	Explain the working of test instruments.

Course outcomes	CO1	**AEI-304.1**	Explain the working of analoginstruments.
	CO2	**AEI-304.2**	Explain the working of Digital instruments.
	CO3	**AEI-304.3**	Analyse the working of cathode ray oscilloscope for different wave forms.
	CO4	**AEI-304.4**	Explain the working of AF and RF signal generators.
	CO5	**AEI-304.5**	Explain the working principles of test instruments.

LEARNING OUTCOMES:

1.0 Analog instruments

1.1 Classify the analog measuring instruments.
1.2 List the different torques needed for driving analog instruments.
1.3 Explain the construction and principle of operation of PMMC instrument.
1.4 Explain the principle of operation of extending the range of DC ammeter.
1.5 Explain the principle of operation of extending the range of DC voltmeter.
1.6 Explain the construction and principle of operation of Moving Iron instrument.
1.7 Explain the principle and working of rectifier type voltmeters.
1.8 Explain the construction and principle of operation of series and shunt type ohmmeters.
1.9 State the need for high input impedance for a voltmeter.
1.10 Explain the working of FET input voltmeter with necessary circuit (DC/AC).
1.11 Explain the working of differential voltmeters.
1.12 Define sensitivity of voltmeter and explain loading effect.
1.13 State the use of Megger for insulation measurements.
1.14 Give the classification of bridge circuits.
1.15 Mention the balancing conditions of bridges (AC and DC).
1.16 Explain the resistance measurement using Wheatstone bridge.
1.17 Explain the inductance measurement using Maxwell's bridge.
1.18 Explain the capacitance measurement using Schering bridge.
1.19 Solve problems on sensitivity of voltmeter and above bridges.

2.0 Digital instruments

2.1 List the advantages of digital instruments over analog instruments.
2.2 Explain the working of digital voltmeters (RAMP type, successive approximation type) with block diagrams.
2.3 List the specifications of digital voltmeters.
2.4 Explain the working of Digital Multimeter with block diagram.
2.5 List the specifications of Digital Multimeter.
2.6 Explain the working of Digital frequency meter with block diagram.
2.7 List the specifications of Digital frequency meter.
2.8 Explain the working of Digital LCR meter with block diagram.
2.9 List the specifications of Digital LCR meter.

3.0 Cathode Ray Oscilloscope

3.1 Draw the block diagram of general purpose CRO and Explain the function of each block.
3.2 Sketch CRT and Explain the function of each block.
3.3 State the necessity of time base generator.
3.4 Write the expression for deflection sensitivity.
3.5 List the conditions for stationary and flicker free waveforms.
3.6 Explain triggered sweep with necessary circuit, and mention its advantages.
3.7 List the front panel controls of CRO and state their function.
3.8 List its specifications of CRO.

3.9 List the applications of CRO.

3.10 Explain the procedure for measurement of voltage (DC and AC), frequency and phase using CRO.

3.11 Explain the Dual Trace Oscilloscope with block diagram.

3.12 Explain the principle of operation of Storage oscilloscope with block diagram.

3.13 Explain the principle of operation of Digital oscilloscope with block diagram.

4.0 Signal generators

4.1 Explain the working of AF Oscillator (sine and square) with block diagram.

4.2 List the front panel controls of AF Oscillator and state their function.

4.3 List specifications of AF Oscillator.

4.4 Explain the working of Function generator with block diagram.

4.5 List the applications of AF oscillators and function generators.

4.6 Explain the working of RF signal generator.

4.7 List specifications and applications of RF signal generator.

4.8 State the importance of shielding in RF generators.

5.0 Test Instruments

5.1 Define Q-Factor.

5.2 Explain the working of Q-meter with diagram.

5.3 Explain the working of Digital IC tester with block diagram.

5.4 Explain the working of Logic analyzer with block diagram.

5.5 State the necessity of Plotter and Recorders.

5.6 List the different Recorders.

5.7 Explain the working of XY recorders.

5.8 Explain the working of Plotter.

CO-PO/PSO MATRIX

CO No	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
AEI-304.1	*2*							*2*	*1*	
AEI-304.2	*1*							*2*	*1*	
AEI-304.3	*2*	*1*			*2*			*2*	*1*	
AEI-304.4	*1*	*1*						*2*	*1*	
AEI-304.5	*1*				*1*			*2*	*1*	
Average	***1.4***	***1***			***1.5***			***2***	***1***	

3= strongly mapped

2= moderately mapped

1= slightly mapped

COURSE CONTENTS

1. **Analog instruments:**
   PMMC Instrument, extending the range of instruments, Moving Iron Instruments, rectifier type voltmeter, Series and Shunt type ohmmeter, FET input voltmeter, Meggar, differential voltmeter, Wheatstone, Maxwell, Schering Bridge.

2. **Digital Instruments:**
   Digital voltmeter (Ramp Type, Successive Approximation Type), Digital Multimeter,Digital frequency meter, Digital LCR Meter.

3. **Cathode Ray Oscilloscope:**
Block diagram of general purpose CRO, triggered sweep circuit, front panel controls of CRO. Specifications and applications of CRO, dual trace CRO, Storage CRO, Digital CRO.

4. **AF and RF signal generators**
   AF oscillator-specifications, function generator, RF signal generator-specifications.

5. **Test instruments:**
   Q meter, Plotter and Recorders. Digital IC tester, Logic analyser.

Reference Books

1. David A Bell - Electronic instrumentation and measurements, PHI.
2. H S Khalsi - Electronic Instrumentation,TMH.
3. Cooper - Electronic Measurements & Instruments, PHI.
4. Khandpur - Modern Electronic Equipment,TGH.
5. A K Sawhney - Electrical, Electronic Measurements and Instruments,Dhanpat Rai.

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S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Analog instruments	17	17	9	8			3	1			CO1
2	Digital instruments	11	14	6	8			2	1			CO2
3	CRO	17	14	6	8			2	1			CO3

4	Signal generators	8	14	6	8			2	1			CO4
5	Test instruments	7	11	3	8			1	1			CO5
	Higher order question from 1or 2 or 3 Chapters		10			10				1		CO1,CO2,CO3
	Total	**60**	**80**	**30**	**40**	**10**	**-**	**10**	**5**	**1**	**-**	**-**

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 2.9
Unit Test-II	From 3.1 to 5.8

BOARD DIPLOMA EXAMINATIONS (C-20)

DAEIE-III SEMESTER EXAMINATION

ELETRONIC MEASURING INSTRUMENTS- AEI (304)

Time: 3 Hours **Max Marks: 80**

PART –A

Instructions:1) Answer all Questions. **10x3=30 M**

2) Each carries THREE marks

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

1. Classify the analog measuring instruments. (CO1)

2. State the need for high input impedance for a voltmeter. (CO1)

3. Define sensitivity of voltmeter. (CO1)

4. List any three advantages of digital instruments over analog instruments. (CO2)

5. List the specifications of digital LCR meter. (CO2)

6. State the procedure for measurement of AC voltage. (CO3)

7. List the front panel controls of CRO . (CO3)

8. List the applications of AF oscillators. (CO4)

9. State the importance of shielding in RF generators. (CO4)

10. Define Q-meter (CO5)

PART-B

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks.
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer. **5x8=40 M**

11. (A) Explain the construction and principle of operation of moving iron instrument. (CO1)

Or

(B) Explain the capacitance measurement using Schering bridge. (CO1)

12. (A) Explain the working of Ramp type digital voltmeter with block diagram. (CO2)

Or

(B) Explain the working of digital frequency meter with block diagram. (CO2)

13. (A) Explain the working of dual trace oscilloscope with a block diagram. (CO3)

Or

(B) Explain triggered sweep with necessary circuit. (CO3)

14. (A) Explain the working of RF signal generators with diagram. (CO4)

Or

(B) Explain the working of function generator with diagram (CO4)

15. (A) Explain the working of digital IC tester with block diagram. (CO5)

Or

(B) Explain the working of X-Y recorder (CO5)

PART- C

1×10=10

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

16. A 1 mA meter movement with an internal resistance of 100Ω is to converted into a 0-100mA. Calculate the value of shunt resistance required. (CO1)

***

DAEIE- FIRST UNIT TEST

MODEL QUESTION PAPER(C-20)

ELECTRONIC MEASURING INSTRUMENTS (AEI-304)

Time: 90 Mins. Total Marks: 40M

PART- ATotal: 16M

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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. i)The balancing equation of AC bridge is ---------		(CO1)	4X1M=4M
ii) The digital multimeter is used to measure -------		(CO2)	
iii) The PMMC instrument is AC measurement (T/F)		(CO2)	
iv) The use of Megger is ----------		(CO2)	
2. Classify the analog measuring instruments	(CO1)	3M	
3. Define sensitivity of voltmeter		(CO2)	3M
4. List the advantages of digital instruments over analog instruments	(CO2)	3M	
5. List the specifications of Digital Multimeter	(CO1)	3M	

PART- B 3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question and each question carries Eight marks

6. (A). Explain the construction and principle of operation of PMMC instrument. (CO2)

Or

(B). Explain the resistance measurement using Wheatstone bridge (CO1)

7.(A). Explain the working of RAMP type digital voltmeters (CO2)

Or

(B). Explain the working of Digital LCR meter with block diagram. (CO2)

8. (A). Explain the principle and working of rectifier type voltmeters. (CO2)

Or

(B). Explain the working of Digital frequency meter with block diagram. (CO2)

***

PROCESS INSTRUMENTATION

Course code	Course title	Periods/Week	Total no. of periods	Marks for FA	Marks for SA
AEI-305	**Process Instrumentation**	05	75	20	80

S. NO	Major Topics	No. of Periods	COs Mapped
1	Fundamentals of Instrumentation	10	CO1
2	Displacement and position measurement	11	CO1
3	Temperature measurement	08	CO2
4	Pressure measurement	08	CO3
5	Flow measurement	14	CO3
6	Level measurement	08	CO3
7	Density and Viscosity measurement	08	CO4
8	Measurement of Weight &Humidity	08	CO5
	TOTAL	**75**	

<table>
<tr><td colspan="4">Upon completion of the course the student shall be able to</td></tr>
<tr><td>Course Objectives</td><td colspan="2">(i)

(ii)</td><td>Explain the importance of instrumentation fundamentals.

Explainthe various measurement techniques used for the measurement of displacement, position, temperature, pressure, flow, level, density, viscosity, weight and humidity process Industries.</td></tr>
<tr><td rowspan="5">Course outcomes</td><td>CO1</td><td>AEI-305.1</td><td>Use transducers for the measurement of Displacement and position</td></tr>
<tr><td>CO2</td><td>AEI-305.2</td><td>Analyse the working of transducers for the measurement of temperature</td></tr>
<tr><td>CO3</td><td>AEI-305.3</td><td>Use transducers for the measurement of pressure, flow and Level</td></tr>
<tr><td>CO4</td><td>AEI-305.4</td><td>Use of densitometers and viscometers for measurement of Density and Viscosity</td></tr>
<tr><td>CO5</td><td>AEI-305.5</td><td>Use of load cells and Hygrometers for measurement of weight and Humidity.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="3">1 Fundamentals of Instrumentation

1.1 To Explainthe following terms.

(a) Accuracy
(b) Precision
(c) Error
(d) Linearity
(e) Hysteresis
(f) Resolution and scale readability
(g) Threshold
(h) Repeatability
(i) Reliability and maintainability
(j) Span
1.2 Define calibration and state the need of calibration.
1.3 Define the terms transducer and Sensor.
1.4 Give the classification of thetransducers.
1.5 Define Active transducer and passive transducer with examples.
1.6 State the basic requirements of Transducers.</td></tr>
</table>

2.0Displacement and position measurements

2.1 Explain the principle of operation of the following.

a. Linear potentiometers
b. Linear variable differential transformers (LVDT)
c. Linear variable Reluctance transducers (LVRT)

2.2 Explain the principle of Inductive and capacitive proximity sensors for position measurement.

2.3. a) Explain the principle of Resistance strain gauge.
b) Derive the expression for gauge factor and solve simple problems.
2.4.Explain the principle of operation of Rotary variable differential transformer (RVDT).
2.5. State the importance of vibration monitoring.
2.6. Explain the principle of operation of the following for linear velocity measurement.

a. Moving coil type velocity transducer
b. Moving iron type velocity transducer

2.7 Explain the principle of operation of the following for angular velocity measurement.

a. A.CTacho generators
b. Photo electric Tachometer
c. Toothed rotor variable reluctance Tachometer.

3.0 Temperature measurement

3.1 Define the term Temperature

3.2 Classify the temperature transducers.

3.3. Explain the principle of operation of the following :

(a) Bi-metallic strip
(b) Liquid filled thermometers.

3.4 a) Explain the principle of operation of Resistance Temperature Detector.

b) Derive the expression of coefficient of temperature for RTD $\alpha = (R_T - R_0) / R_0(T_2 - T_1)$ and solve simple problems.

3.5. Explain the principle of operation of the following

a) Thermocouple
b) Thermistor

3.6List the types of pyrometers.

		3.7 Explain the principle of operation of the following: a) Optical pyrometer b) Radiation pyrometers 3.8 List range and applications for the following: a) Bi-metallic strip b) Liquid filled thermometers. c) Resistance Temperature Detector d) Thermocouple e) Thermistor f) Optical pyrometer g) Radiation pyrometers 3.9 a) Explain the principle of operation of Solid state sensors. b) List any three IC temperature sensors with its ranges and uses **4.0 Pressure measurement** 4.1 To know the description and principle of operation of Elastic elements for pressure measurement Like (a) Membrane diaphragm (b) Thin plate diaphragm (c) corrugated diaphragm (d) Single capsule (e) Double capsule (f) Bellow (g) C-shaped bourdon tube (h) Twisted bourdon tube (j) Helical bourdon tube 4.2 Know the description and principle of operation of Electrical pressure transducers such as (a) Potentiometric device (b) Strain gauge transducer (c) Variable reluctance sensor (d) LVDT type transducer (e) Variable capacitance device (f) Thin film pressure transducer (g) Force – Balance Transducer (h) Piezo – electric pressure transducer 4.3 State the necessity and principle of pressure multiplexer 4.4 Explain the pressure calibration using dead weight tester. **5.0 Flow measurement** 5.1 Explain the principle of operation and list the applications of the following.

(a) Head – type flow meter based on differential pressure measurement like such as
   I. Orifice plate
   II. Venturi tube
   III. Pitot tube
(b) Electromagnetic flow meters.
(c) Rotameters (variable – area meters)
(d) Mechanical flow meters
   I. Positive displacement type (Nutating disc type)
   II. Turbine flow meters.
(e) Anemometers
   I. Cup type Anemometers
   II. Hot wire/hot film type Anemometers.
(f) Ultrasonic flow meters
(g) Thermal flow meters.
(h) Laser anemometers.

6.0 Level measurement

6.1 Explain the principle of operation and list the applications of the following.

(a) Liquid level sight glass
(b) Float Actuated level indicators
(c) Resistive type level indicator.
(d) Inductive type level indicator.
(e) Capacitance type level indicators
(f) Nucleonic level gauge.
(g) Ultrasonic level gauge

7.0 Density and viscosity measurement

7.1 Define the term density
7.2 State the necessity of density measurement.
7.3 Explain the principle of operation of the following :
   (a) Displacement type densitometer
   (b) Fluid dynamic type densitometer
   (c) Capacitance type densitometer
7.4 Define the term Viscosity.
7.5 State the necessity of Viscosity measurement
7.6 Explain the principle of operation of the following :
   (a) Capillary viscometers
   (b) Falling ball viscometers
   (c) Rotating viscometers

		8.0 Measurement of Weight &Humidity 8.1 Explain the principle of operation of the following for weight measurement and list their applications. a. Hydraulic load cells b. Pneumatic load cells c. Strain gauge load cells 8.2 Define Humidity and relative Humidity. 8.3 Explain the description and principle of operation of the following. (a) Condensation type Hygrometers (b) Electrolytic Hygrometers.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-305.1	1	1						3	2	
AEI-305.2	1	1			1			3	2	1
AEI-305.3	1	1			1			3	2	1
AEI-305.4	1	1		1				3	2	1
AEI-305.5	1	1						3	2	1
Average	**1**	**1**		**1**	**1**			**3**	**2**	**1**

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENTS

1. Fundamentals of Instrumentation

Accuracy, Precision, Error, Linearity, Hysteresis, Resolution, scale readability, Threshold, Repeatability, Reliability, Maintainability, Span,, Calibration. Classification of Transducers, Basic Requirements of transducers.

2. Displacement and Position Measurements

Linear potentiometers, L.V.D.T, linear variable Reluctance Transducers, Inductivity & capacitive proximity sensors, Resistance strain gauge, RVDT, vibration monitoring, linear velocity measurement- moving coil type velocity transducers, moving iron type velocity transducers, Angular velocity speed measurements -AC Tacho generators, Photo electric tachometer, Toothed rotor variable reluctance tachometer

3. **Temperature measurement**
Bimetallic strip ,liquid filled thermometer. Resistance temperature Detectors, thermocouple, Thermistor , Pyrometer, IC temperature sensors

4. **Pressure measurement**: Elastic elements used for pressure measurements and principle of pressure transducers, principle of pressure multiplexer ,pressure calibration

5. **Flow measurement:**Head type of flow meters , electromagnetic flow meters, rotameters , mechanical flowmeters, Anemometers, Ultra sonic flow meters, thermal flowmeters , Pneumatic transmitters. Orifice plate, Electromagnetic flow meters and Turbine flow meters.

6. **Level measurement:** Liquid level sight glass , float actuated level indicator, resistance, inductance, capacitance type level indicators, nucleonic, Ultrasonic level gauges.

7 . **Density and viscosity measurements :** Displacement type, Fluid dynamic type, Capacitance type density measurement. Capillary viscometers, Falling ball viscometers, Rotating viscometers,

8. **Measurement Weight &Humidity :** Hydraulic load cells, Pneumatic load cells, Strain gauge load cells,Humidity, Relative humidity, Condensation type Hygrometer, Electrolytic hydrometer.

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1. Patranabis - Principles of Industrial Instrumentation ,McGraw-Hill Education – Europe.
2. S.K.Singh - Industrial Instruments and Control ,TMH.
3. D. S. Kumar, Mechanical Measurements and Control, Metropolitan Book Company Pvt. Limited, 1979.
4. Liptack - Instrument Engineer Hand Book, CRC press.
5. M.M.S. Anand - Electronics Instruments and Instrumentation Technology,PHI.
6. Rangan Mani and Sharma - Instrumentation Measurement, Devices and systems, TMH.
7. E.B. Jones - Instrument Technology Vol-I,Newnes-Butterworth, 1957.
8. DVS Murthy - Transducers Technology, PHI.
9. Nakra & Chowdary - Electronic Measurement and Instrumentation,TMH.
10. A.K. Sahwney - Electrical and Electronics Measurement and Instrumentation, Dhanapathi Rai.
11. Instrumentation design studies by Nernest O.Doebelin

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S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Fundamentals of Instrumentation	10	06	6				2				C01
2	Displacement and position measurement	11	03	3				1				CO1
3	Temperature measurement	08	06	6				2				CO2
4	Pressure measurement	08	11	3	8			1	1			CO3
5	Flow measurement	14	14	6	8			2	1			CO3
6	Level measurement	08	11	3	8			1	1			CO3
7	Density measurements and Viscosity measurements	08	11	3	8			1	1			CO4
8	Measurement of weight & Humidity	08	08		8				1			CO5
	Higher order question from chapter 3	--	10			10				1		CO2
	Total	**75**	**80**	**30**	**40**	**10**	**-**	**10**	**5**	**1**	**-**	**-**

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 4.1
Unit Test-II	From 4.2 to 8.3

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- THIRD SEMESTER EXAMINATION
PROCESS INSTRUMENTATION

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.	Define the terms Accuracy and precision.	(CO1)
2.	Define the terms Span and Range.	(CO1)
3.	State the importance of vibration monitoring.	(CO1)
4.	Define the term Temperature.	(CO2)
5.	List any three applications of Thermistor.	(CO2)
6.	State the necessity pressure multiplexer.	(CO3)
7.	List any three applications of Orifice meter.	(CO3)
8.	Draw the diagram of rotameter .	(CO3)
9.	State the principle of Ultrasonic level gauge.	(CO3)
10.	State the necessity of density measurement.	(CO4)

PAR- B

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks.
2) Answers should be comprehensive and criterion for valuation is the content but notthe length of the answer. **5x8=40 M**

11 (A). Explain the principle of operation of Force balance transducer with diagram. (CO3)

or

(B). Explain pressure calibration using Dead Weight Tester. (CO3)

12. (A). Explain the principle of operation of Electromagnetic flow meter with diagram. (CO3)

Or

(B). Explain the principle of operation of Venturi flow meter with diagram. (CO3)

13 (A). Explain the principle of operation of Liquid level sight glass with diagram. (CO3)

Or

(B). Explain the principle of operation of Nucleonic level gauge with diagram. (CO3)

14.(A). Explain the principle of operation of Displacement type densitometer. (CO4)

Or

(B). Explain the principle of operation of Capillary viscometer. (CO4)

15. (A). Explain the principle of operation of Hydraulic load cell with diagram. (CO5)

Or

(B). Explain the principle of operation of Condensation type Hygrometer with diagram.(CO5)

PART- C **1×10=10**

Instructions: 1) Answer the following question carries ten marks.
2) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16.Derive the expression of coefficient of temperature for RTD (CO2)

$\alpha = (R_T - R_0) / R_0 (T_2 - T_1)$

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)

PROCESS INSTRUMENTATION(AEI-305)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions.
(2) First question carries four marks and each of rest carries three 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 i)Define Linearity (CO1) 4X1M=4M
ii) Degree of closeness to the true value is called ------- (CO2)
iii) The unit of Temperature is --------- (CO2)
iv) Bellows is an elastic element used for pressuremeasurement (True/False). (CO3)

2. State the principle of AC Tachometer (CO1) 3M
3. State the importance of vibration monitoring. (CO1) 3M
4. Classify temperature transducers. (CO2) 3M
5. List three applications of Thermocouple. (CO2) 3M

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question and each question carries Eight marks.

6. (A). Explain the principle of operation of LVRT with diagram. (CO1)

or

(B). Explain the principle of operation of Moving iron type velocity transducer with diagram. (CO1)

7. (A). Explain the principle of operation of radiation type pyrometer with diagram.(CO2)

Or

(B). Explain the principle of operation of Thermister.
(CO2)

8. (A). Explain the principle of operation of C-shaped bourdon tube for the measurement of pressure.
(CO3)

or

(B). Explain the principle of operation of single capsule and double capsule for the measurement of pressure.(CO3)

***

PROGRAMMING IN 'C'

Course code	Course title	No.of periods/week	Total no. of periods	Marks for FA	Marks for SA
AEI-306	**Programming in 'C'**	05	75	20	80

S. NO	Major Topics	No. of Periods	COs Mapped
1	C Programming Basics	16	CO1
2	Decision & Loop Control Statements	18	CO2
3	Arrays & Strings	16	CO3
4	Functions in C	13	CO4
5	Structures, Unions & pointers	12	CO5
	TOTAL	**75**	

Upon completion of the course the student shall be able to			
Course Objectives	i) programming in C language ii)Explainthe programming in C language iii)Learn the practical importance and applications of programming in C language		
Course outcomes	CO1	AEI-306.1	Explain the statements of C Programming.
	CO2	AEI-306.2	Explain decision and loop control statements of C Programming.
	CO3	AEI-306.3	Analyse the concepts in strings and arrays C programming.
	Co4	AEI-306.4	Explain the functions in C-Programming.
	Co5	AEI-306.5	Explain the structures , unions and pointers in C-Programming.
Learning Outcomes		**1.0 'C' Programming Basics** 1.1 Define High level language and low level language 1.2 Explain the structure of C language Program 1.3 State the function of pre-processor directives 1.4 List pre-processor directives.	

		1.5 Explain the pre-processor directives: #define, #include by taking examples 1.6 List the steps involved in executing the C program 1.7 Mention the character set of C language. 1.8 Define the Keywords and list them 1.9 Define the Identifiers and give examples. 1.10 List the data types used in C and explain them with examples. 1.11 Explain constants and variables. 1.12 State the declaration of variables. 1.13 List the five Arithmetic Operators and give their precedence. 1.14 State the assignment statement. 1.15 List the shorthand assignment operators and explain with examples. 1.16 Define an expression and show how to evaluate an Arithmetic Expression. 1.17 Explain the increment and decrement operators. 1.18 List the relational operators used in C. 1.19 List the logical operators supported by C 1.20 Give the operator precedence. 1.21 Explain evaluating a logical expression. 1.22 List the bitwise logical operators 1.23 Explain bitwise logical operators. 1.24 Explain printf () and scanf () functions with examples. **2.0 Decision & Loop Control Statements** 2.1 State the importance of decision making statements in programming 2.2 List decision making statements 2.3 Write the syntaxes of the following decision making statements and explain a. If b. If.. else. c. Nested if …else d. If… else ladder .. 2.4 Write the syntax of switch statement and explain. 2.5 Explain conditional operator. 2.6 Write simple programs using decision making statements. 2.7 Define a loop in a C and list loop/iterative statements 2.8 Write the syntaxes of the following loop control statements and explain a. for b. while c. do… while 2.9 Define nested loops. 2.10 Compare between while and do .. while loop statements 2.11 Compare between for and do .. while loop statements 2.12 Write a program to display first n natural numbers using loops. 2.13 Write a program to find sum of given numbers using loops. 2.14 Write a program to print fibonacci series using loops. 2.15 Differentiate between break and continue statements. **3.0 Arrays & Strings** 3.1 Define an Array. 3.2 Explain declaration and initialization of One Dimensional Array.

		3.3 Explain accessing the elements in the Array. 3.4 Write a C program to find largest / smallest number in an array 3.5 Write a C program to sorting the numbers in an array. 3.6 Explain declaration and initialization of two Dimensional Arrays. 3.7 Explain accessing elements of two dimensional arrays with sample program of matrix addition/subtraction. 3.8 Define String 3.9 State the declaration and initialization of String variables. 3.10 List and Explain the functions used for reading and writing strings. 3.11 Explain the String handling functions strcat(),strcmp(),strcpy() and strlen() with examples. 3.12 Write a c program to check whether the given string is palindrome or not. 3.13 Write a c program to reverse the given string. **4.0 Functions in 'C'** 4.1 Define function. 4.2 List various standard built in functions 4.3 State the need for user defined functions 4.4 Explain function declaration in programs 4.5 Define function prototype 4.6 Define a function call 4.7 Explain return values and their types 4.8 Illustrate functions with no arguments and no return values with a program to find sum and average of any 5 numbers. 4.9 Illustrate functions with arguments with no return values with a program to findsum and average of any 5 numbers. 4.10 Illustrate functions with arguments with return values with a program to find sumand average of any 5 numbers. 4.11 Illustrate functions with no arguments with return values with a program to findsum and average of any 5 numbers. 4.12 Differentiate between Local and External Variables 4.13 List the four storage classes supported by 'C' **5.0 Structures, Unions and Pointers** 5.1 Define a structure 5.2 Explain declaring structure variable. 5.3 Explain initialization of structure. 5.4 Explain the concept of structure assignment. 5.5 Explain accessing members of a structure with example. 5.6 Illustrate structures with a program to read & print a book database consisting of Title of book, author, no. of pages, price as fields. 5.7 Define a Union. 5.8 Differentiate between structure and union. 5.9 Define a pointer. 5.10 Declare a pointer ,assign a pointer ,initialize a pointer. 5.11 Differentiate address and dereferencing operators. 5.12 Write a sample programs to declare and initialize the pointers.

COURSE CONTENT

1.0 C-Programming Basics

Structure of a C programme, Character Set, Constants, Variables, Data types, Arithmetic, Logical, Relational operators and precedence – Assignment, Increment, Decrement operators, evaluation of expressions.

2.0 Decision and Loop control Statements

If, If-else, Nested If else, Break, Continue and Switch statements. Loops:- For, While, Do-while, Nesting of Loops.

3.0 Arrays and Strings

1 D Array declaration, Initialization, 2 D Array declaration, Initialization, Accessing of Array elements, Character Arrays declaration and Initialization of Strings, Display of strings with format.

4.0 Functions in C

Function-Definition, Declaration, Return statement-
Function calls, Storage classes of variables.

5.0 Structures, Unions and Pointers

Structure features, Declaration and Initialization, Accessing of Structure members, Union, Pointer concepts.

REFERENCE BOOKS

1C,Balaguru Swamy.E- Programming in ANSI, 3rd Edition, TMH.
2.Samarjit Ghosh- Programming In C,PHI.
3. Kamthane - Programming with ANSI and Turbo C, Pearson Education.
4.Gottfried- Programming in C,Schaum Series.
5. Reema Thareja - Programming in C , Oxford university press.
6.Yashwant Kanetkar- Let us C, BPB Publication, New Delhi.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-306.1	1							3	2	
AEI-306.2	1	1			1			3	2	
AEI-306.3	1	1			1			3	2	
AEI-306.4	1	1			1			3	2	
AEI-306.5	1	1						3	2	
Average	**1**	**1**			**1**			**3**	**2**	

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

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S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	C Programming Basics	16	14	6	8			2	1			CO1
2	Decision & Loop Control Statements	18	17	9	8			3	1			CO2
3	Arrays & Strings	16	14	6	8			2	1			CO3
4	Functions in C	13	14	6		8		2		1		CO4
5	Structures, Unions & pointers	12	11	3		8		1		1		CO5
	Higher order question from chapters 2 or 3		10			10				1		CO2,CO3
	Total	**75**	**80**	**30**	**24**	**26**	**-**	**10**	**3**	**3**	**-**	**-**

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 2.15
Unit Test-II	From 3.1 to 5.12

C-20-AEI-306

BOARD DIPLOMA EXAMINATION, UNIT TEST- 1 (C-20)
DAEIE- THIRD SEMESTER EXAMINATION
PROGRAMMING IN C

Time: 3 Hours Total Marks: 80M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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) Keyword for Decimal Number data type in C _____ (CO1)
   (b) Logical AND operation is denoted by _____ . (CO1)
   (c) The instruction a += 2; represents _____ . (CO1)

(d) An array contains 10 elements. The index of last element is 10 : True / False (CO3)

2. List any six data types supported by C. (CO1)
3. State the importance of conditional expressions in a C program. (CO1)
4. Differentiate 'break' and 'continue' statements. (CO2)
5. What is Array and how do access the elements of it? (CO1)

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question andeach question carries Eight marks.

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. (CO1)

(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)

***

BOARD DIPLOMA EXAMINATION, UNIT TEST- II (C-20)

DAEIE- THIRD SEMESTER EXAMINATION

PROGRAMMING IN C

Time: 3 Hours Total Marks: 80M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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) _____ is a reading string in C (CO3)
   (b) _____ is a storage class in C (CO4)
   (c) _____ is a symbol for pointer variable in C (CO5)
   (d) a[10] is a ---------- dimensional array (CO3)
2. State the syntax of array in C. (CO3)
3. Define function in C.. (CO4)
4. Define structure in C. (CO5)
5. Define a union in C. (CO5)

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question and each question carries Eight marks.

6. (A).Explain declaration and initialization of two Dimensional Arrays. (CO3)

   (Or)

   (B) Write a c program to check whether the given string is palindrome or not. (CO3)

7. (A). Explain return values and their types (CO4)

   (or)

   (B) Differentiate between Local and External Variables (CO4)

8. (A)Differentiate between structure and union. (CO5)

   (or)

   (B)Differentiate address and dereferencing operators. (CO5)

***

C-20-AEI-306

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- THIRD SEMESTER EXAMINATION
PROGRAMMING IN C

Time: 3 Hours Total Marks: 80M

PART- A3×10=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 simplesentences.

1. Write the basic structure of a C program. (CO1)
2. List any six data types supported by C. (CO1)
3. List the bit wise logical operators. (CO2)
4. Differentiate 'break' and 'continue' statements. (CO2)
5. State the declaration of variables (CO2)
6. What is Array and how do access the elements of it. (CO3)
7. What is the operation of 'string' function? (CO3)
8. What is the need of User Defined Function in programming? (CO4)
9. List the four storage classes supported by C. (CO4)
10. Define Structure and give an example to it. (CO5)

PART- B

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer. 5x8=40 M

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 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

1×10=10

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

16. Write a C program to display even numbers between 1 and 50 using Loops (CO3).

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Electronic Circuits Lab

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-307	Electronic Circuits Lab	3	45	40	60

S No	Chapter/ Unit Title	No. of Periods	COs Mapped
I	FET & MOSFET	09	CO1
II	Amplifiers	12	CO2
III	Oscillators & Multivibrators	12	CO3
IV	Circuit simulation using Pspice or equivalent	12	CO4
	TOTAL	45	

Upon completion of the course the student shall be able to:

Course Objectives	1. Plot the characterises of electronic devices and to construct amplifiers and Oscillators.		
	2. Simulate rectifiers, amplifiers and Oscillator circuits using simulation software.		
	3. Learn the practical importance of Electronic Circuits.		
Course Out comes	**CO1**	**AEI-307.1**	Plot the characteristics of FET and MOSFET.
	CO2	**AEI-307.2**	Construct the Amplifiers to Plot their frequency responses.
	CO3	**AEI-307.3**	Construct Oscillators & Multivibrators and obtain their output waveforms.
	CO4	**AEI-307.4**	Simulate amplifiers, Oscillators and multivibrator using P-spice or equivalent.

LEARNING OUTCOMES:

I. FET & MOSFET :

1. Identify the terminals of FET and plot the drain and transfer characteristics of FET.
2. Identify the terminals of MOSFET and plot the drain characteristics of MOSFET and calculate the values of Transconductance (g_m) and drain resistance (r_{ds}).

II. AMPLIFIERS:

3. Perform an experiment on RC coupled Amplifier, plot its frequency response and measure the bandwidth (BW).
4. Perform an experiment on CE amplifier with and without feedback and compare its frequency response.

III. OSCILLATORS and MULTIVIBRATORS:

5. Implement Colpitt's oscillator and verify the effect of varying the tank circuit component values and observe output waveforms.
6. Implement Crystal oscillator and observe output waveforms.
7. Implement RC Phase shift oscillator and verify the effect of varying the RC component values and observe output waveforms.
8. Construct transistorised astable multivibrator and draw its waveforms.

IV. Circuit simulation using Pspice or equivalent:

9. Familiarize with the Pspice modelling using e-CAD software
   - Representation of passive elements
   - Representation of active elements
   - Representation of time Vary signals
10. Simulate of CE amplifier and observe the effect of disconnecting bypass capacitor.
11. Simulate Hartley oscillator circuit and observe the effect of change in component values.
12. Simulate transistorised Monostable circuit and observe the effect of change in component values.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-307.1	1	1		3				*3*	*2*	
AEI-307.2	1	1		3				*3*	*2*	
AEI-307.3	1	1		3				*3*	*2*	
AEI-307.4	1	1			1			*3*	*2*	*1*
Average	1	1		3	1			***3***	***2***	***1***

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

DIGITAL ELECTRONICS LAB

Course code	Course title	Total no. of periods	No. Of periods per week	Marks for FA	Marks for SA
AEI-308	DIGITALELECTRONICS LAB	45	3	40	60

S.NO	Major Topics	No. of Periods	COs Mapped
I	Combinational Logic circuits	18	CO1
II	Sequential Logic Circuits	21	CO2
III	A/D and D/A Converters	06	CO3
	TOTAL	**45**	

Upon completion of the course the student shall be able to			
Course Objectives	i)Implement different combinational, sequential logic circuits and obtain truth tables. ii)Explain A/D and D/A converters.		
Course outcomes	CO1	**AEI-308.1**	Implement combinational logic circuits and verify truth tables.
	CO2	**AEI-308.2**	Implement Sequential logic circuits and verify truth tables.
	CO3	**AEI-308.3**	Verify the working of A/D and D/A converters
Learning Outcomes		**COMBINATIONAL LOGIC CIRCUITS** 1. Verify the truth tables of Logic gates - AND, OR, NOT (Using IC's). 2. Verify the truth tables of Logic gates - NAND, NOR, Exclusive OR (using IC's). 3. Implement Half-adder using IC logic gates. 4. Implement Full-adder using IC logic gates.	

		5. Verify the truth table of Multiplexer using IC 74153 6. Verify the truth table of De-multiplexers 7. Implement any given Boolean function using logic gates. **I. Sequential Logic Circuits** 8. Verify the truth tables for RS, D, T, and JK and Master - Slave JK Flip-flops. 9. Verify function of counter (ICs like 7490, 7492, 7493, 74 C 93, 74160). 10. Verify function of shift register (ICs like 74104, 74185, 74 C 164, 7495, 74194 etc.) 11. Construct a comparator circuit using 7485 and verify the truth table. **II. A/D and D/A converters** 12. Verify the working Successive Approximation type A/D converter. **13.** Verify the working of R-2R D/A converter.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-308.1	2							3	2	
AEI-308.2	3	3						3	2	
AEI-308.3	1				1			3	2	
Average	**2**	**3**			**1**			***3***	***2***	

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

ELECTRONIC MEASURING INSTRUMENTS LAB

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-309	ELECTRONIC MEASURING INSTRUMENTS LAB	3	45	40	60

S.NO	Major Topics	No. of Periods	COs Mapped
I	Analog instruments	15	CO1
II	Digital instruments	15	CO2
III	Signal generators & CRO	15	CO3
	TOTAL	**45**	

Upon completion of the course the student shall be able to			
Course Objectives		(i)	Measure various parameters of electrical & electronics using measuring Instruments.
Course outcomes	CO1	**AEI-309.1**	Use analog instruments.
	CO2	**AEI-309.2**	Use digital instruments for the measurement of various parameters.
	CO3	**AEI-309.3**	Use of signal generator & CRO for measurement of different parameters.
		I. **Analog Instruments:-** 1. Conduct an experiment to Calibrate Ammeter and Voltmeter. 2. Conduct an experiment to extend the range of Ammeter and Voltmeter. 3. Conduct an experiment to convert an Ammeter to Voltmeter. 4. Conduct an experiment to construct series and shunt Ohmmeter. 5. Measure the Insulation resistance of a given equipment by using Megger. **II. Digital Instruments:-** 6. Study the front panel of a Digital LCR meter.	

Learning Outcomes		7. Measure Inductance (L), Capacitance (C) and Resistance (R) using digital LCR meter. 8. Study the front panel of a digital IC tester. 9. Test some digital ICs using using Digital IC tester. 10. Measure the frequency of a given signal using digital frequency meter. **III. Signal Generator and CRO:-** 11. Measure the frequency of an Unknown Signal Using Lissajous figures on CRO. 12. Study the use of different types of probes used for CRO.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-309.1	2			1				2	2	
AEI-309.2	2			1	1			2	2	
AEI-309.3	2			1				2	2	
Average	**2**			**1**	**1**			**2**	**2**	

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

PROCESS INSTRUMENTATION LAB

Course code	Course title	No. Of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-310	PROCESS INSTRUMENTATION LAB	3	45	40	60

S. NO	Major Topics	No. of Periods	COs Mapped
I	Displacement measurement	9	CO1
II	Velocity measurement	3	CO2
III	Temperature measurement	12	CO3
IV	Pressure measurement	3	CO4
V	Flow measurement	3	CO5
VI	Level measurement	6	CO6
VII	Density and Viscosity measurement	6	CO7
VIII	Weight & Humidity measurement	6	CO8
	TOTAL	**45**	

Upon completion of the course the student shall be able to			
Course Objectives		(i)	Practice various measurement techniques used for the measurement of displacement, Velocity, temperature, P^H, Conductivity, humidity and moisture in process industries.
Course outcomes	CO1	**AEI-310.1**	Perform exercises to measure the linear displacement, angular displacement using different transducers
	CO2	**AEI-310.2**	Perform exercises to measure the velocity using tachometer

	CO3	**AEI-310.3**	Perform exercises to measure the temperature using RTD, Thermocouple, Thermistor
	CO4	**AEI-310.4**	Conduct an experiment to measure the pressure using pressure transducers.
	CO5	**AEI-310.5**	Conduct an experiment to Measure the flow using flow meters.
	CO6	**AEI-310.6**	Conduct an experiment to Measure the level using Level Indicators.
	CO7	**AEI-310.7**	Conduct an experiment to Measure the density using densitometers and viscosity using viscometers
	CO8	**AEI-310.8**	Conduct an experiment to measure the weight using load cells, and relative humidity using Hygrometer
Learning Outcomes		**I. DISPLACEMENT MEASUREMENT** 1. Measure the Linear Displacement using LVDT and plot a graph betweer and displacement. 2. Measure the Linear Displacement using Resistive Transducer and plo between resistance and displacement. 3 Measure the Angular Displacement using Resistive Transducer and plo between resistance and displacement. **II. Velocity measurement** 4. Measure the angular velocity using Tachometer and plot graph betwee and velocity. **III. Temperature measurement** 5. Measure the Temperature using RTD and plot graph between temper resistance. 6. Measure the Temperature using Thermister and plot the following graphs (a) Between temperature and resistance (b) Between voltage and temperature 7. Measure the Temperature using Thermocouple and plot a graph temperature and voltage. 8.Measure the temperature using IC LM335 **IV. PRESSURE MEASUREMENT** 9. Measure the Pressure using Strain gauge pressure transducer. **V. FLOW MEASUREMENT**	

		10.Measure the Flow rate using Rotameter **VI .LEVEL MEASUREMENT** 11. Measure the Level using i. Float type level indicator ii. Resistive type level indicator **VII. DENSITY & VISCOSITY MEASUREMENT** 12. Measure the Density of given sample using a densitometer. 13. Measure the viscosity of given sample using falling Ball viscometer. **VIII. WEIGHT & HUMIDITY MEASUREMENT** 14. Measure Weight using Load cell. 15. Measure the relative humidity using hygrometer.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-310.1	1							3	2	
AEI-310.2	1							3	2	
AEI-310.3	1				1			3	2	
AEI-310.4	1							3	2	
AEI-310.5	1				1			3	2	
AEI-310.6	1							3	2	
AEI-310.7	1							3	2	
AEI-310.8	1							3	2	
Average	1				1			**3**	**2**	

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

PROGRAMMING IN C& MATLAB

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-311	PROGRAMMING IN C & MATLAB	03	45	40	60

S No	Chapter/ Unit Title	No. of Periods	COs Mapped
I	C Programming Basics	6	CO1
II	Decision & Loop Control Statements	9	CO2
III	Exercises on functions	6	CO3
IV	Arrays, Strings and Pointers in C	9	CO2
V	Structures and Unions	6	CO3
VI	MAT Lab	9	CO4
	Total	45	

Course Objectives	1. To familiarize with programming in Programming In C and MATLAB		
	2. To Explainthe programming concepts of Programming In C and MATLAB		
	3. To learn the practical importance and applications of programming in C and MATLAB.		
Course Out comes	CO1	AEI-311.1	Explain the usage of C Compiler.
	CO2	AEI-311.2	Apply loop, control statements, Arrays and strings in C language
	CO3	AEI-311.3	Apply pointers, functions, structurers and unions in C-Language.
	CO4	AEI-311.4	Practice on basics of MATLAB.

LEARNING OUTCOMES:

I. C Programming Basics

1. Familiarize with turbo Compiler features.
2. Write a program to display "WELCOME TO C PROGRAMMING" on the screen
3. Write a program to accept input of various data types and display on the sreeen

II. Decision & Loop Control Statements

4. Write a program to find the largest of given three numbers using Decision (if, if-else, nested if –else) statements
5. Write a program to perform arithmetic functions using Switch –case statements
6. Write a program to find the factors of a given number using 'for' loop
7. Write a program to print n natural numbers using 'while' loop
8. Write a program to find the sum of n natural numbers using 'do_while' loop

III. Exercises on functions

9. Write a program to find the factorial of a given number using recursion

IV. Arrays, Strings and Pointers in C

10. Write a program to find the smallest element in an array
11. Write a program to find addition of two (3 X 3) matrices
12. Write a program using string functions for string comparison, copying and concatenation
13. Write program to swap two numbers using pointers

V. Structures and Unions

14. Write a program to store information of students using Structures
15. Write a program to access Union members in C

VI. MAT LAB

16. Familiarize with MATLAB Compiler environment, command line arguments, HELP and know about various tool boxes available in MATLAB
17. Write a program to check whether the entered year is leap year or not using decision making statements (if-end, if-else-end, nested if –else-end)
18. Write a program to find the factorial of a given number using loop control statements (while , for loops)
19. Write simple programs to create simple 1D & 2D arrays and perform addition & subtraction operations

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-311.1	1			1	*1*			*3*	*2*	
AEI-311.2	1			1	*1*			*3*	*2*	
AEI-311.3	1			1	*1*			*3*	*2*	
AEI-311.4	1			1	*1*			*3*	*2*	
Average	1			1	***1***			***3***	***2***	

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

IV SEMESTER

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

IV SEMESTER

Subject Code	Name of the Subject	Instruction periods/week		Total Periods /semester	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	EndExam Marks	Total Marks
THEORY								
AEI-401	Engineering Mathematics – III	3	-	45	3	20	80	100
AEI-402	Linear Integrated Circuits	5		75	3	20	80	100
AEI-403	Micro Controllers and Applications	5		75	3	20	80	100
AEI-404	Process control	5		75	3	20	80	100
AEI-405	Industrial Electronics	4		60	3	20	80	100
AEI-406	Analytical Instrumentation	5		75	3	20	80	100
PRACTICAL								
AEI-407	Linear IC Applications and e-CAD Lab		3	45	3	40	60	100
AEI-408	Communication Skills		3	45	3	40	60	100
AEI-409	Micro Controllers and Applications Lab		3	45	3	40	60	100
AEI-410	Process control Lab		3	45	3	40	60	100
AEI-411	Analytical Instrumentation Lab		3	45	3	40	60	100
TOTAL		27	15	630	-	320	780	1100

AEI-401,408 common with all branches.

C-20

ENGINEERING MATHEMATICS-III

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
AEI-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 Explainthe concept of Fourier Series expansion of functions.

Course Outcomes	CO1	Solve homogeneous and non-homogeneous differential equations of second and higher order.
	CO2	Find 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.O1.1 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 Explain 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 $k,\ e^{ax},\ \sin ax, \cos ax,\ x, x^n$ 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 t^n and division by t, Laplace transform of derivatives, evaluation of some definite integrals using Laplace Transforms and solve simple problems.

Syllabus for Unit test-I completed

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 scale property 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 s and solve simple problems.

2.10 Write inverse Laplace transforms of functions using partial fractions and solve some simple problems.

2.11 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 $(c,\ c+2\pi)$ and $(c,\ c+2l)$ 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 , 2π) and (-π , π)

3.5 Write Fourier series for even and odd functions in the interval $(-\pi,\ \pi)$ and $(-l, l)$ 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, π) and and expand simple functions.

Syllabus for Unit test-II completed

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 Explainthe 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	
2	CO1, CO2, CO3	37	82.2%	3	>40% Level 3
3	CO1, CO2, CO3	32	71.1%	3	Highly addressed
4	CO1, CO2, CO3	32	71.1%	3	
5					25% to 40% Level 2 Moderately addressed
6					
7					
PSO 1	CO1, CO2, CO3	37	82.2%	3	
PSO 2	CO1, CO2, CO3	45	100%	3	5% to 25% Level 1 Low addressed
PSO 3	CO1, CO2, CO3	36	80%	3	<5% Not addressed

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	3	3	2	2	1	1	CO1
2	Unit - II Laplace Transforms	18	33	11	11	11	0	2	2	2	0	CO2
3	Unit - III Fourier Series	12	19	3	3	3	10	1	1	1	1	CO3
Total		**45**	**80**	**25**	**25**	**17**	**13**	**5**	**5**	**4**	**2**	

R: Remembering Type : 25 Marks
U: understanding Type : 25 Marks
Ap: Application Type : 17 Marks
An: Analysing Type : 13 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, AEI-401**

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-II**

Sub Code: **AEI-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 (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 _____ (CO1)

   c. _____ (CO2)

   d. then : State TRUE/FALSE (CO2)

2. Solve (CO1)

3. Find the particular integral of (CO1)

4. Evaluate (CO2)

5. Evaluate (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 (CO1)

or

B) Solve (CO1)

7. A) Solve (CO1)

or

B) Solve (CO1)

8. A) Evaluate (CO2)

or

B) Evaluate (CO2)

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C –20, AEI-401

Unit Test II

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-II**

Sub Code: **AEI-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. then : State TRUE/FALSE (CO2)

   b.

   (CO2)

   c. (CO2)

   d. Write the Fourier series for the function in the interval (CO3)

2. Evaluate (CO2)

3. Evaluate (CO2)

4. Evaluate (CO2)

5. Evaluate Fourier coefficient for in the interval (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 (CO2)

or

B) Evaluate (CO2)

7. A) Evaluate (CO2)

or

B) Evaluate (CO2)

8. A) Obtain the Fourier series for the function in the interval (CO3)

or

B) Obtain the half range Fourier cosine series of in (CO3)

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END EXAM MODEL PAPER
STATE BOARD OF TECHNICAL EDUCATION, A.P
ENGINEERING MATHEMATICS –AEI- 401

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

PART-A

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

1. Solve **CO 1**
2. Solve **CO 1**
3. Find the particular integral of differential equation **CO 1**
4. Find the particular integral of differential equation **CO 1**
5. Find **CO2**
6. Find **CO2**
7. Find **CO2**
8. Find the value of in the Fourier expansion of in the interval **CO3**
9. Find the Fourier coefficients of in the interval **CO3**
10. Find the value of in the half range cosine series of in the interval **CO3**

PART-B

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

11. A) Solve **CO 1**

Or

B) Solve **CO 1**

12. A) Solve **CO1**

Or

B) Solve **CO1**

13. A) Evaluate **CO2**

Or

B) Evaluate **CO2**

14. A) Evaluate **CO2**

Or

B) Evaluate **CO2**

15. A) Find **CO2**

Or

B) Using convolution theorem find **CO2**

PART-C

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

16. Find the Fourier expansion of in the interval and hence deduce that **CO3**

***

STATE BOARD OF TECHNICAL EDUCATION, A.P
ENGINEERING MATHEMATICS – AEI-401

TIME : 3 HOURS **MODEL PAPER- 2** **MAX.MARKS : 80M**

PART-A

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

1. Solve **CO 1**
2. Solve **CO 1**
3. Find the particular integral of differential equation **CO 1**
4. Find the particular integral of differential equation **CO 1**
5. Find **CO2**
6. Find **CO2**
7. Find **CO2**
8. Find the value of in the Fourier expansion of

   in the interval **CO3**
9. Write Euler's formula of Fourier expansion of in the interval **CO3**
10. Find the value of in the half range cosine series of in the interval

    CO3

PART-B

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

11.A) Solve **CO 1**

Or

B) Solve **CO 1**

12.A) Solve **CO1**

Or

B) Solve **CO1**

13.A) Evaluate **CO2**

Or

B) Evaluate **CO2**

14.A) Evaluate **CO2**

Or

B) Using Laplace transforms evaluate **CO2**

15.A) Find **CO2**

Or

B) Using convolution theorem find **CO2**

PART-C

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

16. Find the Fourier expansion of in the interval and hence deduce that **CO3**

***

LINEAR INTEGRATED CIRCUITS

Course code	Course title	Periods/Week	Total no. of periods	Marks for FA	Marks for SA
AEI-402	**LINEAR INTEGRATED CIRCUITS**	05	75	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Introduction to Operational amplifiers	12	CO1
2	Linear applications of Operational amplifiers	18	CO2
3	Active filters	15	CO3
4	555 Timer IC	12	CO4
5	Nonlinear applications of operational amplifier	18	CO5
	TOTAL	75	

Upon completion of the course the student shall be able to			
Course Objectives	i) Familiarize with the characteristics of operational amplifiers. ii)Know the applications of operational amplifiers. iii)Explain the operation of LPF, HPF, BPF and BSF using OP Amp. iv)Explain the operation of 555 timer and its applications.		
Course outcomes	CO1	AEI-402.1	Anayse the characteristics of operational amplifiers.
	CO2	AEI-402.2	Analyse the op-amp application circuits
	CO3	AEI-402.3	Explain the operation of LPF, HPF, BPF and BSF using OP Amp.
	CO4	AEI-402.4	Explain the operation of 555 timer and its applications.
	CO5	AEI-402.5	Analyse the non linear applications of op-amp.

Learning Outcomes		**1.0 Introduction to operational amplifiers** 1.1 State the requirements of an operational amplifier. 1.2 Draw the circuit of differential amplifier. 1.3 Explain the operation of differential amplifier. 1.4 Draw and explain the block diagram of a typical integrated circuit operational amplifier. 1.5 Draw the schematic symbol of operational amplifier. 1.6 List and sketch different package styles of analog ICs. 1.7 Draw the pin diagrams of metal can package and dual-in-line package for a typical IC 741 or equivalent. 1.8 List the basic specifications of ideal operational amplifier. 1.9 Define Voltage gain $\mathbf{A_V}$, output impedance $\mathbf{Z_o}$, input impedance $\mathbf{Z_i}$, Bandwidth **BW**, input offset voltage $\mathbf{V_{io}}$, input offset current $\mathbf{I_{io}}$, input bias current $\mathbf{I_B}$, and also give the typical values for an ideal op-amp and IC 741 or equivalent operational amplifier. 1.10 Define C.M.R.R and give the typical values for an ideal and practical operationalamplifier. 1.11 State the need for high C.M.R.R. 1.12 Define slew rateand give the typical values for an ideal and practical operational amplifier. 1.13 List the applications of Operational Amplifier. **2.0 Linear applications of operational amplifiers** **2.1** Explain the open loop operation of an operational amplifier. **2.2** Mention the effects of negative feedback on an amplifier. **2.3** Draw and explain the operation of inverting and non- inverting amplifiers. **2.4** Draw and explain the operation of Voltage follower circuit using operational amplifier. **2.5** Draw and explain the operation of summing amplifier anddifference amplifier using OP-amp. **2.6** Solve simple problems on summing amplifier and difference amplifier using OP-amp. **2.7** Draw and explain the operation of ideal and practical integrator and differentiator circuits. **2.8** Draw and explain the operation of current to voltage converter using OP-amp. **2.9** Draw and explain the operation of voltage to current converter using OP-amp. **2.10** Draw and explain the operation of Instrumentation amplifier using Op-amp. and also with bridge circuit. **3.0Explainthe active filters** **3.1** Define Filter. **3.2** List the types of Active filters. **3.3** List the limitations/disadvantages of passive filters. **3.4** State how active filters overcome the above limitations. **3.5** Draw the ideal and practical frequency response plots for a LPF, HPF, BPF, BSF and All Pass Filter. **3.6** Define Pass band and Stop band.

		3.7 Draw and explain the operations of first order LPFand HPF using operational amplifier with its frequency responses. **3.8** Draw and explain the operations of first order BPF(narrow & wide) and BSF (narrow & wide) using operational amplifiers with its frequency responses. **3.9** List the disadvantages of active filters. **4.0 Explainthe operation and application of 555 Timer IC.** 4.1 Draw the block diagram of 555 timer IC. 4.2 Explain the operation of various blocks of a 555 timer IC. 4.3 Draw the pin diagram of 555 IC and Mention the function of each pin. 4.4 Draw and explain the operation of monostable Multivibrator using 555 IC timer. 4.5 Draw and explain the operation of Astable multivibrator using IC 555 timer. 4.6 Mention the applications of 555 Timer IC. **5.0 Non-Linear Applications of operational amplifier** **5.1** Draw and explain the operation of square wave generator. **5.2** Draw and explain the operation of wien bridge oscillator. **5.3** Draw and Explain the operation of Triangular wave generator. **5.4** Draw and explain the operationof basic comparator circuit. **5.5** Draw and explain the operation of Schmitt trigger circuit with its waveforms. **5.6** Explain the principle of operation of phase locked loopwith the help of block diagram. **5.8** List the applications of PLL.

COURSE CONTENTS

1.0 **Introduction to Operational amplifiers:** Block diagram of typical operational amplifier; IC package, pin identification, **Definitions:** Input offset voltage, input offset current, input bias current, Voltage gain, input and outputimpedances, bandwidth,slew rate, CMRR with reference to operational amplifier, specifications of ideal op-amp.

2.0 **Linear Applications of Operational amplifiers:** Open loop op-amp configuration, inverting and non-inverting amplifier. Op-amp with feedback: adder, subtractor, integrator, differentiator, Instrumentation amplifier, voltage to current converter and current to voltage converter.

3.0 **Active Filters:** Low pass, high pass, Band pass and Band elimination filters, frequency responses.

4.0 **555 Timer IC:** Block diagram and operation of 555 timer IC, Monostable, As table multivibrator operations using 555 timer IC.

5.0 **Non-Linear applications of Operational amplifier:** Square wave generator, wein bridge oscillator, Triangular wave generator, Basic comparator, Schmitt trigger, PLL.

REFERENCE BOOKS

1. Ramakanth AGaykwad- Op Amps & Linear Integrated Circuits,Pearson .
2. Roy Chowdary- linear Integrated Circuits, New Age International Publisher.
3. Botkar -Integrated Circuits,Khanna publications.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-402.1	1	1						3	2	
AEI-402.2	1	1			1			3	2	
AEI-402.3	1	1						3	2	
AEI-402.4	1	1						3	2	
AEI-402.5	1	1			1			3	2	
Average	**1**	**1**			**1**			**3**	**2**	

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

BLUE PRINT

S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Introduction to Operational amplifiers	15	14	6	8			2	1			CO1
2	Linear applications of Operational amplifiers	15	14	6		8		2		1		CO2
3	Active filters	15	14	6	8			2	1			CO3
4	555 Timer IC	15	14	6	8			2	1			CO4
5	Nonlinear applications of Operational amplifiers	18	14	6		8		2		1		CO5
	Higher order question from chapter 2 or 5		10				10				1	CO2,CO5
	Total	**75**	**80**	**30**	**24**	**16**	**10**	**10**	**3**	**2**	**1**	**-**

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 2.10
Unit Test-II	From 3.1 to 5.8

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- FOURTH SEMESTER EXAMINATION
LINEAR INTEGRATED CIRCUITS

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. List any three specifications of op-amp. (CO1)
2. Define Slew rate. (CO1)
3. Mention the effects of negative feedback on an amplifier. (CO2)
4. Draw the circuit of difference amplifier using operational amplifier. (CO2)
5. Define Filter. (CO3)
6. List any three limitations of passive filters. (CO3)
7. Mention any three applications of 555 Timer IC. (CO4)
8. Draw the pin diagram of 555 IC. (CO4)
9. List any three applications of PLL. (CO4)
10. Draw the basic comparator using op-amp. (CO4)

PART- B

5×8=40

Instructions: 1) Answer either (A) or (B) from each question, 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). Explain the operation of differential amplifier. (CO1)

Or

(B). Draw and explain the block diagram of a typical integrated circuit operational amplifier. (CO1)

12. (A). Draw and explain the operation of Instrumentation amplifier using Op-amp with bridge circuit. (CO2)

Or

(B). Draw and explain the operation of ideal integrator circuit using OP-amp. (CO2)

13. (A). Draw and explain the operation of first order LPF using operational amplifiers with its frequency response. (CO3)

Or

(B). Draw and explain the operation of first order narrow BPF using operational amplifier with its frequency response. (CO3)

14. (A). Draw and explain the operation of Astable multivibrator using IC 555 timer. (CO4)

Or

(B). Explain the operation of various blocks of a 555 timer IC. (CO4)

15. (A). Explain the operation of Schmitt trigger circuit with its waveforms. (CO4)

Or

(B). Explain the operation of square wave generator using Op-Amp. (CO4)

PART- C

1×10=10

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

16. Design Instrumentation amplifier of gain 10 using three op-amps (CO2)

***

DAEIE- FIRST UNIT TEST

MODEL QUESTION PAPER(C-20)

LINEAR INTEGRATED CIRCUITS- (AEI-402)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions.
(2) First question carries four marks and each of rest carries three 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. i) Draw the circuit symbol of Op-Amp. (CO1)4X1M=4M
   ii)For an Op-Amp with negative feedback the voltage gain is increased. (T/F)(CO2)
   iii) The voltage gain of a Non –inverting Op-Amp is ---------. (CO2)
   iv) Give the ideal and practical value of input impedance ofOp-Amp. (CO1)
2. Define C.M.R.R. (CO1) 3M
3. List any three applications of Operational Amplifier. (CO2) 3M
4. Draw the circuit of current to voltage converter using OP-amp. (CO2) 3M
5. Mention any three effects of negative feedback on an amplifier. (CO2) 3M

PART- B **3×8M=24M**

Instructions: Answer either (A) or (B) from each question andeach question carries Eight marks.

6. (A). Draw and explain the block diagram of a typical integrated circuit operational amplifier. (CO1)

   or

   (B). Explain the operation of differential amplifier. (CO1)

7. (A). Explain the open loop operation of an operational amplifier (CO2)

   Or

   (B). Draw and explain the operation of practical differentiator circuit using operational amplifier. (CO2)

8. (A). Draw and explain the operation of Instrumentation amplifier using Op-amp with bridge circuit. (CO2)

   or

   (B). Define the terms . (CO2)
   i)Voltage gain (**A_V**)
   ii) output impedance (**Z_o**)
   iii) input offset voltage (**V_{io}**),
   iv)Bandwidth (**BW).**

***

MICRO CONTROLLERS AND APPLICATIONS

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-403	**Micro Controllers And Applications**	5	75	20	80

S. NO	Major Topics	No. of Periods	COs Mapped
1	Architecture of 8051	17	CO1
2	Instruction set of 8051	19	CO2
3	Programming concepts	21	CO3
4	Interfacing Peripherals ICs	09	CO4
5	Applications	09	CO5
	TOTAL	**75**	

Upon completion of the course the student shall be able to			
Course Objectives	(i)	Explainarchitecture, programming and its applications	
Course outcomes	CO1	**AEI-403.1**	Explain the functional block diagram of 8085 & 8051 .
	CO2	**AEI-403.2**	Explain the instruction set and addressing modes of 8051 microcontroller.
	CO3	**AEI-403.3**	Write the assembly level language programs of 8051 microcontroller.
	CO4	**AEI-403.4**	Illustrate interfacing different peripherals 8255, 8257with 8051 microcontroller.
	CO5	**AEI-403.5**	Explain the applications of 8051 microcontroller.
Learning Outcomes		**1.0 Architecture of Microcontroller 8051** 1.1 Explain the functional block diagram of 8085 Microprocessor. 1.2 List the differences between Microprocessors and microcontrollers. 1.3 List the features of 8051 micro controller.. 1.4 Draw and explain the functional block diagram of 8051 microcontroller. 1.5 Explain the register structure of 8051. 1.6 State the importance of special function registers and list them. 1.7 Draw the pin diagram of 8051 micro controller & specify the purpose of each pin.	

		1.8 Explain internal memory and external memory organization of 8051. 1.9 State the need of timers/counters in 8051 1.10 List the timers/counters of 8051 1.11 Explain the timers/counters of 8051. 1.12 List the input/output ports of 8051. 1.13 Explain the input/output ports of 8051 1.14 Define an interrupt 1.15 List the interrupts of 8051. 1.16 Explain the following interrupts of 8051. i. Timer interrupts (TF0 and TF1) ii. Serial port interrupts (TI/RI) iii. External interrupts (INT0 and INT1) **2.0 Instruction set of 8051 micro controller** 2.1 State the need for an instruction set. 2.2 Draw and explain the instruction format of 8051 with an example. 2.3 Define fetch cycle, execution cycle and instruction cycle. 2.4 Distinguish between machine cycle and T-state. 2.5 Draw the timing diagrams for memory write, memory read operations of 8051. 2.6 Define the terms machine language, assembly language, and mnemonics. 2.7 Differentiate machine level programming and assembly level programming. 2.8 List the major four groups in the instruction set. 2.9 Explain the data transfer, arithmetic, logic and branching instructions. 2.10 Classify the 8051 instructions into one byte, two byte and three byte instructions. 2.11 List the five addressing modes of 8051. 2.12 Explain the following addressing modes of 8051. a. Immediate b. Register c. Direct d. Register indirect e. indexed 2.13 List and explain data transfer instructions. 2.14 List and explain the arithmetic instructions 2.15 List and explain the logic instructions. 2.16 List and explain the branching instructions. **3.0 Programming concepts** 3.1 Draw the various symbols used in flow charts. 3.2 Draw flow charts for following simple problems. 3.2.1 Addition of two 8-bit numbers 3.2.2 Subtraction of 8-bit numbers 3.2.3 Multiplication of 8-bit numbers 3.2.4 Sum of n-numbers 3.3 Write programs of instructions to perform single byte, double byte and multi byte addition and subtraction. 3.4 Write a program to find largest (or smallest) number in an array using jump instruction. 3.5 Write a program using timer/counter techniques.

		3.6 Define a subroutine 3.7 List the advantages of subroutine. 3.8 Define Program Counter, Stack, and Stack pointer. 3.9 Explain the sequence of program when subroutine is called and executed. 3.10 Explain how information is exchanged between the program counter and the stack and identify the stack pointer register when a subroutine is called. 3.11 Explain LCALL and ACALL instructions. 3.12 List and explain unconditional and conditional Return instructions 3.13 Explain PUSH, and POP instructions. 3.14 Write programs using PUSH, and POP instructions. 3.15 Write instructions to set up time delay 3.16 Explain the nesting, multiple ending and common ending techniques in subroutines. 3.17 Define the term debugging. 3.18 Explain the following dynamic debugging techniques. a) Single step b) Break point **4.0 Interfacing of Peripheral ICs** 4.1 Define the term interfacing. 4.2 State the need for interfacing. 4.3 List and name the different types of interfacing peripheral ICs. 4.4 List the features of 8255. 4.5 Draw the pin diagram of 8255. 4.6 Draw and explain the functional block diagram of 8255. 4.7 List the operating modes of 8255. 4.8 Write CWR (Control Word Register) format of 8255. 4.9 Draw and explain the interfacing diagram of 8255 with micro controller 8051. 4.10 List the features of 8257. 4.11 List the operating modes of 8257. 4.12 Draw and explain the functional block diagram of 8257- DMA controller. 4.13 Draw and explain the interfacing diagram of 8257 with micro controller 8051. **5.0 Applications of micro controllers 8051.** 5.1 Explain Traffic light control interface using 8051. 5.2 Explain the Printer interface using 8051. 5.3 Explain the Stepper motor control interface using 8051. 5.4 Explain the seven segment display interface using 8051.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-403.1	2							3	2	
AEI-403.2	2							3	2	
AEI-403.3	2				2			3	2	
AEI-403.4	1							3	2	
AEI-403.5	1	1						3	2	
Average	**1.6**	**1**			**2**			**3**	**2**	

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENTS

1. Architecture of 8051:

Functional block diagram of 8085 microprocessors and Architecture of 8051 Microcontroller, Pin diagram of 8051, registers, timers, interrupts of 8051.

2. Instruction set of 8051:

Instruction set of 8051, instruction format, fetch cycle, execution cycle, instruction cycle, machine cycle, timing diagrams, machine language, assembly language, classification of instructions, addressing modes- Groups of instructions, opcode, and operand.

3. Programming concepts:

Flow charts, single and multi byte addition and subtraction, subroutines- nesting, multiple ending and common ending- debugging, time delay programs.

4. Interfacing Peripheral ICs:

Functional block diagrams of 8255 and 8257, Interfacing of 8255, 8257 with 8051

5. Applications:

Traffic light control, printer interface, stepper motor control, Seven segment display interface

REFERENCE BOOKS:

1. Muhammad Ali Mazidi andJanice Gillispie Mazidi, Rolin D. Mckinlay-The 8051 Micro controller and embedded systems using assembly and C, Pearson Education Inc.
2. Kenneth J. Ayala - 8051 Micro controller, WEST PUBLISHING COMPANY.
3. Myke Predko - Programming customizing the 8051 Microcontroller, TMH.
4. Douglas V Hall - Microprocessors and interfacing, McGraw Hill.
5. Barry Brey - Intel Microprocessors, Prentice-Hall.
6. Mazidi and Mazidi - 8051Micro controllers,Pearson Education India.
7. Kenneth J. Ayala - 8051 Microcontrollers, WEST PUBLISHING COMPANY.

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S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Architecture of 8051	17	17	9	8			3	1			CO1
2	Instruction set of 8051	19	17	9	8			3	1			CO2
3	Programming concepts	21	14	6	8			2	1			CO3
4	Interfacing Peripherals ICs	09	14	6	8			2	1			CO4
5	Applications	09	08			8				1		CO5
	Higher order question from Chapter 3.		10			10				1		CO3
	Total	75	80	30	32	18	-	10	4	2	-	-

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 2.16
Unit Test-II	From 3.1 to 5.4

C-20-AEI-403

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- FOURTH SEMESTER EXAMINATION
MICROCONTROLLER AND APPLICATIONS

Time: 3 Hours Total Marks: 80M

PART- A3×10=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. List the interrupts of 8051 micro controller. (CO1)
2. State the need of Special Function Registers in 8051. (CO1)
3. List any three differences between Microprocessors and Micro Controllers. (CO1)
4. Define the terms Fetch Cycle and Execution Cycle. (CO2)
5. List any three addressing modes of 8051. (CO2)
6. Define the term “Machine Language”. (CO2)
7. Define the term “Debugging” . (CO3)
8. Define the term “Program Counter”. (CO3)
9. Write Control word Register format of 8255. (CO4)
10. State the need of interfacing. (CO4)

PART- B

5×8=40

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks.
2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

11. (A). Explain the functional block diagram of 8085 Microprocessor. (CO1)

    or

    (B). Explain the functional block diagram of 8051 Micro Controller . (CO1)

12. (A). Explain the data transfer and arithmetic instructions with examples. (CO2)

    or

    (B). Explain the Immediate and Register addressing modes. (CO2)

13. (A). Explain the PUSH and POP instructions with examples. (CO3)

    Or

    (B). Write a programme to perform addition of two 8-bit numbers . (CO3)

14. (A). Explain the functional block diagram of 8255. CO4)

    Or

    (B). Explain the functional block diagram of 8257 DMA Controller . (CO4)

15. (A). Explain the interfacing of stepper motor using 8051 Micro Controller. (CO5)

    Or

    (B). Explain the interfacing of Traffic Light control using 8051 Micro Controller. (CO5)

PART- C

1×10=10

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

16. Write a program to generate a rectangular wave of 1khz having 50% duty cycle from (TX0) pin of 8051 timer. Assume XTAL of 12Mhz frequency. (CO3)

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)
MICRO CONTROLLERS AND APPLICATIONS (AEI-403)

Time: 90 Mins. Total Marks: 40M

PART- ATotal: 16M

Instructions: (1) Answer all questions.
(2) First question carries four marks and each of rest carries three 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. i) 8051 is a ------- bit controller. (CO1) 4X1M=4M

   ii) Define Mnemonics.(CO2)

   iii) MOV A,B instruction belongs to arithmetic instruction of 8051. (True/False) (CO2)

   iv) Which register is called permanent storage register in 8051. (CO1)

2. List the features of Microcontroller. (CO1)3M

3. Define fetch cycle and execute cycle. (CO2)3M

4. State the need for an instruction set . (CO2)3M

5. Draw the instruction format of 8051 . (CO2)3M

PART- B **3×8M=24M**

Instructions: (1) Answer either (A) or (B) from each question and
(2)Each question carries Eight marks

6. (A). Draw and explain the functional block diagram of 8051 . (CO1)

Or

(B). Draw the pin diagram of 8051 and specify the purpose of each pin . (CO1)

7. (A). Draw and explain the functional block diagram of 8085. (CO1)

Or

(B). Explain the data transfer instructions with examples . (CO2)

8. (A). Explain the addressing modes of 8051 with examples . (CO2)

Or

(B). Explain the arithmetic instructions with examples . (CO2)

***

PROCESS CONTROL

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-404	Process Control	5	75	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Introduction to process control	10	CO1
2	Controller principles	15	CO2
3	Final control operation	20	CO3
4	Advanced process Control systems	15	CO4
5	Process instrument diagrams and standards	15	CO5
	TOTAL	**75**	

Upon completion of the course the student shall be able to			
Course Objectives	(i) (ii)	Familiarize with the knowledge of a process control loop, controller principles, tuning, final control operations and advanced process control systems. Familiarize with the knowledge of process line diagrams and standards.	
Course outcomes	CO1	**AEI-404.1**	Explainterms related to process control.
	CO2	**AEI-404.2**	Explainthe controller principles
	CO3	**AEI-404.3**	Explain the principle of operation of final controller elements
	CO4	**AEI-404.4**	Explain the principle of operation of advanced process control system
	CO5	AEI-404.5	Explainthe Process instrument diagrams and standards

Learning Outcomes		**1.0 Introduction to process control** 1.1 Define the terms process and process control. 1.2 Explain the development of automatic process control with example. 1.3 Draw the block diagram of a process control loop. 1.4 Explain each element in a process control loop. 1.5 Explain batch process and continuous process. 1.6 Define the terms controlled variable and manipulated variable. 1.7 Explain controlled variable and manipulated variable with an example. **2.0 Controller principles** 2.1 Define the terms process load, process lag and self-regulation. 2.2 Define the terms error, control lag, dead time, and cycling. 2.3 List the Discontinuous control modes. 2.4 Explain two positions, multi position and floating control modes. 2.5 List the continuous control modes. 2.6 Define proportional control mode. 2.7 Explain proportional control mode. 2.8 Define the terms proportional band, and offset. 2.9 List the characteristics of proportional control mode. 2.10 Define integral control mode. 2.11 Explain integral control mode. 2.12 List the characteristics of integral control mode. 2.13 Define derivative control mode. 2.14 Explain the derivative control mode. 2.15 List the characteristics of derivative control mode. 2.16 List the composite control modes. 2.17 Explain the Proportional-Integral Control modes. 2.18 List the characteristics of Proportional-Integral Control modes. 2.19 Explain PD and PID control modes. 2.20 List advantages and disadvantages of PI, PD & PID controllers. 2.21 State the need for tuning of PID controllers. 2.22 Explain the following methods of tuning of PID controllers a) Ultimate gain method b) Process reaction curve method. **3.0 Final control Operation** 3.1 Explain the Principle of final control operation. 3.2 Draw the block diagram of final control operation and explain its each block. 3.3 State the need for electric to pressure and pressure to electric converters. 3.4 Explain the basic principle of Nozzle-Flapper system with a diagram. 3.5 Explain the principle of operation of Electric to Pressure converter.

		3.6 Explain the principle of operation of Pressure to Electric converter. 3.7 List the different types of Actuators. 3.8 Explain the principle of Pneumatic Actuator with diagram. 3.9 Explain the principle of Hydraulic Actuator with diagram. 3.10 Explain the principle of Electro Pneumatic Actuator with diagram. 3.11 Explain the following Electrical actuators a) Solenoid valve actuator b) Stepper motor actuator 3.12 Solve simple problems on actuators. 3.13 Explain the constructional details of control valve. 3.14 Explain the following : a) Flow – lift characteristics control valves such as Quick opening, Linear, Equal percentage valves, b) Sliding stem Control valves, such as Single seat Plug, Double seat plug and Lifting gate control valves c) Rotating shaft control valves, such as Rotating plug, Butterfly valves and Louvers. **4.0 Introduction to Advanced process Control systems** 4.1 Define the following control system configuration. a) Single variable control system. (i) Independent single variable control system (ii) Interactive single variable control system b) Compound variable control system and c) Multivariable control system 4.2 Draw and explain the block diagram of cascade control system. 4.3 Justify how the cascade control system is better than single loop control system with an example. 4.4 List the applications of cascade control system. 4.5 Draw and explain the block diagram of feed forward control system. 4.6 Explain the feed forward control system with an example. 4.7 Distinguish between feedback and feed forward control systems. 4.8 Explain the operation of Ratio control with a diagram. 4.9 List the applications of Ratio control system. 4.10 Define Adaptive control. 4.11 Explain programmed adaptive control system with block diagram. 4.12 List the applications of adaptive control system. **5.0 To Explainthe process line diagrams, standards** 5.1 Draw the following line diagrams and symbols. a) Process line, connection to process or instrument supply b) Fluid pressure Line. c) Electric signal d) Pneumatic signal e) Hydraulic signal

		f) Capillary tube. g) Electromagnetic or Sonic signal (guided and not guided). h) Undefined signal. i) Mechanical link j) Internal system link (software or data link or computer signal) k) Orifice installed line. l) Point of measurement 5.2 Draw the symbols for the following controllers and transmitters. (a) Pressure transmitter (b) Flow Transmitter (c) Level Transmitter (d) Temperature Transmitter (e) Pressure Controller (f) Flow Controller (g) Level Controller (h) Temperature Controller 5.3 Draw the symbols for the following control valves (a) Hydraulically operated control valve (b) Pneumatically operated control valve (c) Electrically operated control valve (d) Butterfly valve (e) Solenoid Valve (f) Gate valve (g) Gate valve-hand operated (h) Globe Valve (i) Globe valve- hand operated 5.4 Draw the following general instruments by Balloon symbols (a) Instrument at locally mounted (b) Instrument at control centre (c) Instrument- bifunctional /two services (d) Instrument-transmitting type 5.5 Define piping and instrumentation diagram. 5.6 Explain the use of letter codes for identification of instruments. 5.7 List different standards used in Instrumentation. a) ISI b) ANSI c) BS d) ISA e) DIN

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-404.1	1	1						3	2	1
AEI-404.2	1	1						3	2	1
AEI-404.3	2	1			1			2	2	1
AEI-404.4	1	1						2	2	1
AEI-404.5	1	1						3	3	1
Average	**1.2**	**1**			**1**			**2.6**	**2.2**	**1**

COURSE CONTENTS :

1. **Introduction to process control**:
   Process control principle-process control block diagram –typical control variables-controlled variable, manipulated variable- Continuous and Batch process
2. **Controller principles**: -
   process characteristics –process load – process lag-self regulation-control system parameters: - error-variable range–control lag-dead time - cycling. Controller modes–discontinuous-two-position, multi-position, floating, continuous control modes: - proportional, integral, derivative control mode. Composite control modes: - PI, PD and PID-Controller. tuning methods-Ultimate gain method and process reaction curve method.
3. **Final control operation:** -
   Different types of the Actuators: -Pneumatic, Hydraulic, Electrical Actuators-different types of control valves.
4. **Advanced process Control systems**: -
   Single variable – compound variable. Multivariable control systems–cascade control–feed forward control-ratio controls– adaptive control systems.
5. **Process instrumentation diagrams and standards:**
   Line diagrams-Definition of P & I diagrams- Use of letter code of identification of Instruments-Introduction to standards that are widely used in instrumentation Viz., ISI, ANSI, BIS, ISA etc.

REFERENCE BOOKS

1. Donald.P.Eckmann - Automatic process control , Wiley India.
2. Liptak - Instrument Engineers Hand book, Volume II, CRC Press.
3. Chatwal & Anand - Control Valves, Himalaya Publishing House.
4. B.E.Jones - Instrument Technology, Volume I, II, III, Butterworths.
5. Krishnakanth - Computer based Industrial Control, PHI.
6. Peter Harriot - Process Control, J. Williams. Monsanto Company.
7. Coughnour - Process Analysis & Control , WIELY.
8. Curtis .D.Johnson - Process control instrumentation technology, Seventh edition, Pearson.
9. D.Patranabis - Process Control, Tata McGraw Hill Education.
10. George stephanopoulous - Chemical Process Control, Pearson.
11. K.Krishna swamy - Process Control, Anshan Ltd; 2nd edition (14 June 2011).
12. Process control instrumentation technology by Curtis .D.Johnson Seventh edition
13. Process Control by D.Patranabis
14. Chemical Process Control by George stephanopoulous
15. Process Control by K.Krishna swamy

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S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Introduction to process control	10	14	6	8			2	1			CO1
2	Controller principles	15	14	6	8			2	1			CO2
3	Final control operation	20	14	6	8			2	1			CO3
4	Advanced process Control systems	15	14	6	8			2	1			CO4
5	Process instrument diagrams and standards	15	14	6		8		2	1			CO5
6	Higher order question from Chapter 3	--	10				10				1	CO3
	Total	**75**	80	30	24	8	10	10	5	-	1	-

Table specifying 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 5.7

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- FOURTH SEMESTER EXAMINATION
PROCESS CONTROL

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. Define the terms process and process control. (CO1)
2. Define the terms controlled variable and manipulated variable. (CO1)
3. List the characteristics of derivative control mode. (CO2)
4. State the need for tuning of PID controllers. (CO2)
5. List the different types of Actuators. (CO3)
6. State the need for electric to pressure and pressure to electric converters. (CO3)
7. List the applications of cascade control system. (CO3)
8. Define Adaptive control. (CO4)
9. Define piping and instrumentation diagram. (CO5)
10. Draw the symbols for the following: (CO5)
    a) Hydraulically operated control valve
    b) Pneumatically operated control valve
    c) Electrically operated control valve

PART- B

5×8=40

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks.
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A). Explain the development of automatic process control with example. (CO1)

or

(B). Explain batch process with diagram.(CO1)

12. (A). Explain the Ultimate gain method of tuning of PID controller. (CO2)

or

(B). Explain the Proportional-Integral Control modes and list its characteristics. (CO2)

13. (A). Explain the basic principle of Nozzle-Flapper system with a diagram. (CO3)

Or

(B). Explain the principle of Hydraulic Actuator with diagram. (CO3)

14. (A). Draw and explain the block diagram of cascade control system. (CO4)

Or

(B). Explain the operation of Ratio control with a diagram. (CO4)

15. (A). Explain the use of letter codes for identification of instruments. (CO5)

Or

(B). Explain the following standards used in Instrumentation. (CO5)

i). ISI

ii). ANSI

PART- C

1×10=10

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

16. Find the working force resulting from 200N applied to a 1 cm radius forcing piston if the working piston has a radius of 6 cm. And also find the hydraulic pressure. (CO3)

***

DAEIE- FIRST UNIT TEST

MODEL QUESTION PAPER(C-20)

PROCESS CONTROL

(AEI-404)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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. i) Define process (CO1) 4X1M=4M

   ii) Define cycling. (CO2)

   iii) Gain and proportional band are reciprocally related. (True/False) (CO2)

   iv) -------= set point – control variable. (CO2)

2. Define control lag and dead time variable. (CO2) 3M

3. List the discontinues control modes. (CO2) 3M

4 List the characteristics of derivative control mode. (CO2) 3M

5. State the need for electric to pressure and pressure to electric converters.(CO3) 3M

PART- B

3×8M=24M

Instructions: Answer either (A) or (B) from each question and each question carries Eight marks.

6.(A). Explain the development of automatic process control with example. (CO1)

Or

(B) Explain controlled variable and manipulated variable with an example. (CO1)

7.(A). Explain the process reaction curve method of tuning of PID controller. (CO2)

Or

(B). Explain PD and PID control modes. (CO2)

8.(A). Explain the Principle of final control operation. (CO3)

Or

(B). Explain the principle of operation of Pressure to Electric converter. (CO3)

***

INDUSTRIAL ELECTRONICS

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-405	INDUSTRIAL ELECTRONICS	04	60	20	80

S No	Chapter/ Unit Title	No. of Periods	COs Mapped
1	Power Electronic Devices	14	CO1
2	Opto-electronic Devices	14	CO2
3	Ultrasonics	8	CO3
4	Industrial Heating and welding	10	CO4
5	Inverters, SMPS &UPS	14	CO5
	Total	60	

	Upon completion of the course the student shall be able to		
Course Objectives	1. Learn the principles and working of power Electronic devices, opto electronic devices, SMPS, UPS, etc.		
	2. Explain the principle of Industrial heating and welding.		
	3. Learn the practical importance Industrial electronic devices and circuits.		
Course Out comes	CO1	AEI-405.1	Analyse Various Power Electronic Devices like SCR, DIAC, TRIAC etc.
	CO2	AEI-405.2	Explain Various Opto electronic Devices like Photo diode, Photo Transistor, LED etc.
	CO3	AEI-405.3	Explain the methods of generation of Ultrasonics
	CO4	AEI-405.4	Explain Industrial Heating and welding.
	CO5	AEI-405.5	Explain the working of Inverters, SMPS & UPS

LEARNING OUTCOMES

1.0 Power Electronic Devices

1.1 List different thyristor family devices.
1.2 Sketch the ISI circuit symbols of SCR, SCS, SBS, SUS, DIAC, TRIAC and GTO SCR.
1.3 Explain the construction and working of SCR.
1.4 Explain the Two-transistor model of SCR and its V-I Characteristics.
1.5 Mention the ratings of SCR.
1.6 Explain the working of DIAC & TRIAC.
1.7 Explain Volt-ampere characteristics of DIAC & TRIAC
1.8 Analyse the TRIAC triggering in different modes with diagrams.
1.9 Explain the construction and working of UJT.
1.10 Define intrinsic stand-off ratio of UJT.
1.11 Draw and explain the V-I characteristics of UJT.
1.12 Explain SCR triggering using UJT.
1.13 List the applications of DIAC, TRIAC & SCR.

2.0 Opto Electronic Devices

2.1 Draw the circuit symbols of photo diode,photo transistor,LDR and LED.
2.2 Explain the working of photo diode and draw and explain its V-I characteristics.
2.3 Explain the working of photo transistor and draw and explain its V-I characteristics.
2.4 Explain the working of photo multiplier and draw and explain its V-I characteristics.
2.5 List the applications of photo diode,photo transistor and photo multiplier.
2.6 Explain the working of LDR.
2.7 State photovoltaic effect.
2.8 Explain the working of photovoltaic cell.
2.9 List the applications of photovoltaic cells.
2.10 Explain the working of LED.
2.11 Explain the working of LCD.
2.12 Explain the working of opto-coupler.
2.13 List the applications of opto-couplers.
2.14 List the applications of LED and LCD.
2.15 Explain the working of Discrete displays- Dot matrix, Bar matrix , Bar graph and Seven segment display.

3.0 Ultrasonics

3.1 Define Ultrasonics.
3.2 List the properties of ultrasonics.
3.3 Explain the following methods of generation of ultrasonics:
  i. Magnetostriction oscillator/generator.
  ii. Piezo-electric oscillator/generator
3.4 List the applications of Ultrasonics.

4.0 Industrial Heating and welding

4.1 Mention different industrial heating methods.
4.2 Explain the principle of Induction Heating and mention its merits.
4.3 List the applications of Induction Heating.

4.4 Draw the circuit of H.F power source for Induction Heating and explain its working.
4.5 Explain the principle of Dielectric heating.
4.6 List the dielectrics used for dielectric heating.
4.7 Explain the electrodes used in dielectric heating and method of coupling to RF generator.
4.8 Mention applications of Dielectric heating.
4.9 List the types of resistance welding.
4.10 Explain principle of Resistance Welding process.
4.11 Draw basic circuit of A.C. resistance welding and explain the working.

5.0 Inverters, SMPS and UPS

5.1 State the need of inverters.
5.2 State the principle of operation of inverter.
5.3 Classify inverters.
5.4 Explain the working of single-phase bridge inverter using MOSFET.
5.5 Explain the working of voltage source inverter.
5.6 Explain the working of PWM inverter.
5.7 List the applications of inverters
5.8 Explain the working of SMPS with block diagram.
5.9 List the applications of SMPS.
5.10 Classify UPS.
5.11 List the storage batteries used in UPS.
5.12 Explain the working of Off Line UPS and Online UPS.
5.13 List the applications of UPS.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-405.1	1	1		1	1			3	2	
AEI-405.2	1	1		1	1			3	2	1
AEI-405.3	1	1						3	2	
AEI-405.4	1	1		1	1			3	2	1
AEI-405.5	1	1						3	2	
Average	**1**	**1**		**1**	**1**			**3**	**2**	**1**

3= Stongly mapped
2= moderately mapped
1= lightly mapped

COURSE CONTENTS

1. Power Electronic Devices

Thyristor family devices- ISI circuit symbols - working of SCR-Two-transistor model of SCR and its VI Characteristics-ratings of SCR-working of DIAC & TRIAC- Volt-ampere characteristics of DIAC & TRIAC-modes of TRIAC triggering-construction and working of UJT-intrinsic stand-off ratio of UJT-negative resistance region of UJT-SCR triggering using UJT, applications of SCR,TRIAC and DIAC.

2. OptoElectronic Devices

Operation and characteristics of photo diode- operation and characteristics of photo transistor-operation and characteristics of photo multiplier -Applications of photo diode ,photo transistor and photo multiplier- Working Principle of LDR-Principle of photovoltaic cell- Applications of photovoltaic cells- working of opto-coupler- working of LED - working of LCD- Applications of LED and LCD – working of discrete displays, dot-matrix and seven segment displays.

3. Ultrasonics

Generation of Ultrasonics and their applications .

4. Industrial Heating and welding

Induction heating, Dielectric heating, Resistance welding.

5 Inverters, SMPS ,UPS

Need of inverters –principle of Inverter-single phase bridge inverter using MOSFET working of voltage source inverter- working of PWM Inverter -SMPS with block diagram-applications of SMPS -Off Line UPS and Online UPS-applications of UPS

REFERENCE BOOKS

1. P.C.Sen -Power Electronics , TMH.
2. S.K.Bhattacharya, S.Chatterjee- Industrial Electronics and Control, TES.
3. Harish,C Rai -Industrial Electronics,Khanna publications.
4. Biswanth paul - Industrial Electronics and control,PHI.
5. J David Irvin - The industrial Electronics Handbook, CRC.

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Sl 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	**Power Electronic Devices**	**14**	17	9	8			3	1			CO1
2	**Opto Eelectronic Devices**	**14**	14	6	8			2	1			CO2
3	**Ultrasonics**	**8**	3	3				1				CO3
4	**Industrial Heating and Welding**	**10**	14	6	8			2	1			CO4
5	**Inverters, SMPS and UPS**	**14**	22	6	16			2	2			CO5
	Higher order Question from 1		10			10				1		CO1
TOTAL		**60**	**80**	30	40	10	-	10	5	1	-	-

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 2.15
Unit Test-II	From 3.1 to 5.13

C-20-AEI-405

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- FOURTH SEMESTER EXAMINATION
INDUSTRIAL ELECTRONICS

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. List different thyristor family devices. (CO1)
2. Define intrinsic stand-off ratio of UJT . (CO1)
3. Sketch the ISI circuit symbols of SCS and SBS. . (CO1)
4. List the applications of LED. (CO2)
5. State photovoltaic effect. (CO2)
6. Define Ultrasonics. (CO3)
7. Mention different industrial heating methods. (CO4)
8. List the dielectrics used for dielectric heating. (CO4)
9. Classify UPS. (CO5)
10. State the need of inverters. (CO5)

PART- B

5×8=40

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks.
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A). Explain working of DIAC (CO1)
or
(B). Explain the construction and working of SCR. (CO1)

12. (A). Explain the working of photo diode and draw and explain its V-I characteristics.(CO2)
Or
(B). Explain the working of opto-coupler (CO2)

13. (A). Explain principle of Resistance Welding . (CO4)
Or
(B). Explain the principle of Induction Heating (CO4)

14. (A). Explain the working of PWM inverter. (CO5)
Or
(B). Explain the working of SMPS with block diagram (CO5)

15. (A). Explain the working of single-phase bridge inverter using MOSFET.(CO5)
Or
(B). Explain the working of Off Line UPS . (CO5)

PART- C

1×10=10

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

16. Analyse the TRIAC triggering in different modes with diagrams.. (CO1)

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)
INDUSTRIAL ELETRONICS (AEI-405)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions.
(2) First question carries four marks and each of rest carries three 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. i) Sketch the ISI circuit symbol of SCR (CO1)4X1M=4M
   ii) TRIAC stands for ------ (CO1)
   iii) Define latching current . (CO1)
   iv) Photo diode converts---------- (CO2)
2. Mention any three ratings of SCR. (CO1) 3M
3. State the different modes of TRIAC triggering. (CO1) 3M
4. State photo voltaic effect. (CO2) 3M
5. List three applications of opto couplers. (CO2) 3M

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) from each question and each question carries Eight marks.

6. (A). Explain SCR triggering using UJT . (CO1)

   or

   (B). Explain the Two-transistor model of SCR and draw its VI Characteristics . (CO1)

7. (A). Explain Volt-ampere characteristics of DIAC . (CO1)

   Or

   (B). Explain the working of photo multiplier and draw and explain its V-I characteristics. (CO2)

.

8. (A). Explain the working of LCD. (CO2)

   or

   (B). Explainthe working of seven segment display. (CO2)

***

ANALYTICAL INSTRUMENTATION

Course code	Course title	Periods/Week	Total no. of periods	Marks for FA	Marks for SA
AEI-406	ANALYTICAL INSTRUMENTATION	5	75	20	80

S. NO	Major Topics	No. of Periods	COs Mapped
1	Introduction to analytical instrumentation and spectrophotometer	15	CO1
2	Analyzers	15	CO2
3	Mass Spectrometry	12	CO3
4	Chromatography	13	CO4
5	P^H& Conductivity Measurement	10	CO5
6	Nuclear Instrumentation	10	CO6
	Total	**75**	

<table>
<tr><td colspan="4">Upon completion of the course the student shall be able to</td></tr>
<tr><td>Course Objectives</td><td colspan="2">(i)</td><td>Familiarize with the knowledge of analytical instrumentation and Spectrophotometer ,analyzers, Mass spectrometry, Chromatography, Nuclear Instrumentation</td></tr>
<tr><td rowspan="6">Course outcomes</td><td>CO1</td><td>AEI-406.1</td><td>Familiarize with different analytical instruments.</td></tr>
<tr><td>CO2</td><td>AEI-406.2</td><td>Explain the principle of operation of different analyzers and flame photometer, Refractometer Interferometer, polarimeter.</td></tr>
<tr><td>CO3</td><td>AEI-406.3</td><td>Explain the principles of Mass spectrometer.</td></tr>
<tr><td>CO4</td><td>AEI-406.4</td><td>Explain the principles of Chromatography.</td></tr>
<tr><td>CO5</td><td>AEI-406.5</td><td>Explain the measurement of P^H ,Conductivity using P^H meter and Conductivity meter</td></tr>
<tr><td>CO6</td><td>AEI-406.6</td><td>Explain the detection methods of Nuclear radiation.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="3">1.0 Introduction to analytical instrumentation and Spectrophotometer
1.1 Draw and explain the block diagram of Analytical instrumentation.
1.2 Define the term spectroscopy.
1.3 Define the terms atomic spectroscopy and molecular spectroscopy.
1.4 Draw and explain Electromagnetic spectrum.
1.5 State the Beer Lamberts law.
1.6 List the components of a monochromator.
1.7 List types of monochromators (Prism and Grating).
1.8 Explain Prism and Grating Monochromators.
1.9 List different types of Visible, UV and IR light sources.
1.10 List different types of Visible, UV and IR light detectors.
1.11 Explain the principle of operation of the following and list their applications
a. U.V Spectrophoto meter
b. Visible Spectrophotometer
c. IR Spectrophotometer.
2.0 Introduction to Analyzers
2.1 Explain the principle of operation of the following and list their applications
a) Flame Photometer.
b) Spectrofluorometer.
c) Refractometer.
d) Interferometer.
e) Polari meter.
2.2 Explain principle of operation of the following and list their applications
a. Paramagnetic gas analyzer.
b. Zirconia gas analyzer.
c. Electro chemical gas analyzer.
d. Thermal conductivity type analyzer.
e. Auto analyzer.
3.0 Mass spectrometry
3.1 State the principle of Mass spectrometry.
3.2 List the advantages of mass spectrometer.
3.3 Derive the expression for mass charge ratio (m/e).
3.4 Draw and explain the block diagram of mass spectrometer.</td></tr>
</table>

		3.5 Explain the operation of single deflection 180^0 mass spectrometer with schematic diagram. 3.6 Define the resolution of a mass spectrometer. 3.7 List the applications of mass spectrometer. **4.0 Chromatography** 4.1 Define the terms absorption and adsorption. 4.2 Differentiate between the terms absorption and adsorption. 4.3 Define chromatography. 4.4 Classify chromatography. 4.5 List the components of a Gas Chromatography. 4.6 Explain the principle of operation of the Gas Chromatography. 4.7 List the applications of Gas Chromatography. 4.8 List the advantages of the Gas Chromatography 4.9 Explain the principle of operation of the Liquid Chromatography. 4.10 List the applications of Liquid Chromatography. 4.11 List the advantages of Liquid Chromatography **5.0 P^H and conductivity measurement** 5.1 Define P^H. 5.2 Mention the importance of P^H 5.3 State the principle of P^H measurement. 5.4 Explain the measuring and reference electrodes used for P^H measurement. 5.5 State the effect of temperature on P^H 5.6 List the temperature compensating methods in P^H measurement. 5.7 Explain the operation of digital P^H -meters. 5.8 List the specification of digital type of P^H - meters. 5.9 Define conductivity. 5.10 State the necessity of conductivity cells. 5.11 Explain conductivity cells. 5.12 Explain the principle of operation of conductivity meter. **6.0 Nuclear Instrumentation** 6.1 List the types of Radiations. 6.2 List the properties of the following : a) Alpha Particles b) Beta particles c) Gamma particles d) Neutrons 6.3 List the types of radiation detectors. 6.4 Explain the method of Detection of neutrons. 6.5 Explain the working of the following Detection Methods: a) Geiger Muller method b) Ionization chamber c) Scintillation counter.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-406.1	1	1						3	2	
AEI-406.2	1	1	1					3	2	
AEI-406.3	1	1	1		1			3	1	
AEI-406.4	1	1	1		1			3	2	
AEI-406.5	1	1	1					2	1	
AEI-406.6	1	1	1					1	2	
Average	***1***	***1***	***1***		***1***			***2.5***	***1.6***	

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

COURSE CONTENTS

1. **Introduction to analytical Instrumentation**:

Block diagram of Analytical Instrumentation, Electromagnetic spectrum, beer lamberts law, monochromators and lenses, light sources and detectors - UV, IR, and Visible Spectro photometers.

2. **Analyzers:**

Flame Photometer, Spectro flourometer, Refracto meter, Interferometer. Polari meter. Paramagnetic, Zirconia type, Electro chemical and thermal conductivity gas analyzers, Auto analyzer.

3. **Mass spectrometery:**

Principle of operation, advantages and applications of Mass spectrometer.

4. **Chromatography:**

Absorption and adsorption, Principle of operation, advantages and applications of Gas and Liquid chromatography.

5. P^H and conductivity measurement

P^H measurement, Electrodes, Effect of temperature, temperature compensation methods, Digital type of P^H meter, specifications of digital P^H meter, Necessity of conductivity cell, principle of conductivity meter

6. Nuclear Instrumentation:

Types of radiations- Alpha, Beta and Gamma Particles, Neutrons, Radiation detectors- Geiger Muller counter, Ionization chamber, Scintillation counter.

REFERENCE BOOKS

1. Instrumental Methods of Chemical Analysis by Willard, Merritt, Dean, Settle (CBS Publications & Distributors Pvt. Ltd.)
2. Instrumental Methods of Chemical Analysis by Chatwal & Anand (Himalaya Publishing house)
3. Hand Book of Analytical Instrumentation by R.S. Khandpur
4. Industrial Instrumentation by Donald P.Eckman.
5. Industrial Instruments and Control by S.K.Singh.
6. Instrument Engineer Hand Book by Liptack.

BLUE PRINT

S. No	*Major Topics*	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Introduction to analytical instrumentation and spectrophotometer	15	17	9	8			3	1			CO1
2	Analyzers	15	11	3	8			1	1			CO2
3	Mass Spectrometry	12	11	3	8			1	1			CO3
4	Chromatography	13	6	6				2				CO4
5	PH & Conductivity Measurement	10	11	3	8			1	1			CO5
6	Nuclear Instrumentation	10	14	6	8			2	1			CO6
7	Higher order question from Chapter 3 or 4		10			10				1		
	Total	**75**	**80**	**30**	**40**	**10**	**-**	**10**	**5**	**1**	**-**	**-**

Table specifying 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 4.1to 6.5

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- THIRD SEMESTER EXAMINATION
ANALYTICAL INSTRUMENTATION

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. Define the term Spectroscopy. (CO1)
2. List the components of a Monochromator. (CO1)
3. State the Beer Lamberts law. (CO1)
4. List the applications of flame photometer. (CO2)
5. Define the resolution of a mass spectrometer. (CO3)
6. Classify chromatography. (CO4)
7. Give the advantages of Gas chromatography. (CO4)
8. Define P^H. (CO5)
9. List the types of Radiations. (CO6)
10. List the proprieties of gamma particles. (CO6)

PART- B

5×8=40

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks.
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A).Draw and explain the block diagram of Analytical Instrumentation. (CO1)

or

(B). Explain the operation of U.V Spectrophotometer. (CO1)

12. (A).Explain the operation of flame photometer. (CO2)

OR

(B).Explain the operation of Paramagnetic gas analyser. (CO2)

13. (A).Draw and explain the block diagram of mass spectrometer (CO3)

OR

(B).Explain the operation of single deflection 180^0 mass spectrometer (CO3)

14.(A).Explain the operation of digital P^H-meters. (CO5)

OR

(B). Explain the principle of operation of conductivity meter. (CO5)

15. (A). Explain the Ionization chamber method of detection of radiation. (CO6)

OR

(B). Explain the Geiger Muller method of detection of radiation. (CO6)

PART- C **1×10=10**

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

16.Why Gas chromatography-mass spectrometry is not suitable technique for detection of compounds containing sulphur (CO3)

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)
PROCESS INSTRUMENTATION(AEI-406)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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) Beer Lamberts law gives relation between ------- (CO1)

(b) Atomic absorption spectroscopy is also called as absorption flame photometry (True/False) (CO1)

(c) Chromatography is a physical method that is used to separate and analyse-------(CO4)

(d) Write the expression of m/e ratio of Mass spectrometer. (CO3)

2. List the components of a monochromator. (CO1)3M

3. State the principle of Mass spectrometry. (CO3)3M

4. List the applications of auto analyzer. (CO2) 3M

5. Define the terms atomic spectroscopy (CO1) 3M

PART- B

3×8M=24M

Instructions: Answer either (A) or (B) from each question and each question carries Eight marks.

6.(A). Draw and explain the block diagram of Analytic instrumentation. (CO1)

Or

(B). Draw and explain Electromagnetic spectrum. (CO1)

7. (A). Explain the operation of single deflection 180^0 mass spectrometer with schematic diagram. (CO3)

Or

(B). Derive the expression for mass charge ratio (m/e). (CO3)

8. (A). Explain the principle of operation of the Gas Chromatography. (CO4)

Or

(B). Explain the principle of operation of the Liquid Chromatography. (CO4)

***

LINEAR IC APPLICATIONS & E-CAD LAB

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-407	Linear IC Applications & e-CAD Lab	03	45	40	60

S.No	Chapter/ Unit Title	No. of Periods	COs Mapped
I	Operational Amplifier Circuits	21	CO1
II	555 Timers	06	CO2
III	PSpice /Proteus simulation or equivalent	18	CO3
	Total	45	

Upon completion of the course the student shall be able to:

Course Objectives	1.Implement OP-AMP circuits, timers and observe waveforms.		
	2. Simulate OP-AMP circuits using simulation software.		
Course Out comes	CO1	AEI-407.1	Implement the Circuits using OP-AMP and observe the waveforms.
	CO2	AEI-407.2	Implement Timer circuits using 555 IC timer.
	CO3	AEI-407.3	Simulate OP-AMP circuits using P-spice or equivalent.

LEARNING OUTCOMES:

I. Operational Amplifier Circuits

1. To Implement and test IC 741 Op-Amp as
   a) Inverting amplifier b) Non Inverting amplifier c) Voltage follower (Buffer) and observe the wave forms.
2. To Implement and test 741 Operation amplifier as summer and Subtractor
3. To Implement and test 741 Operation amplifier as Differentiator, and Integrator and observe the waveforms.
4. Implement Instrumentation Amplifier using Op-Amp and calculate the gain.
5. Implement Schmitt trigger using Op-Amp and observe the waveforms.

II. 555 Timer

6. Implement Monostable multi vibrator using 555 timers and observe output waveforms.
7. Implement Astable multi vibrator using 555 timers and observe output waveforms.

III. PSpice /Proteus simulation or equivalent

8. Simulate inverting and non-inverting amplifier circuits and observe the waveforms.
9. Simulate summer and Subtractor circuits using op-amp.
10. Simulate Differentiator and Integrator circuits using op-amp and observe the waveforms.
11. Simulate Astable multivibrator using OPAMP in Pspice.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-407.1	3	3			1			3	2	
AEI-407.2	1	1			1			3	2	
AEI-407.3	2	2			1			3	2	
Average	**2**	**2**			**1**			**3**	**2**	

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

COMMUNICATION SKILLS

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
AEI-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

CO No.	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 **AEI-408**	**Course Title: Communication skills** **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 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	Explain 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	Explain 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 Explain 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.

MICROCONTROLLERS AND APPLICATIONS LAB

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-409	Microcontrollersand Applications Lab	3	45	40	60

S. NO	Major Topics	No. of Periods	COs Mapped
I	Familiarization of Microcontroller kit &Keil software	06	CO!
II	Programming using Microcontroller Kit/ Keil software	21	CO2
III	Interfacing with 8051 Microcontroller	18	CO3
	TOTAL	**45**	

<table>
<tr><td colspan="4">Upon completion of the course the student shall be able to</td></tr>
<tr><td rowspan="3">Course Objectives</td><td></td><td>(i)
(ii)

(iii)</td><td>Familiarize with 8051 microcontroller kit and Keil software.
Write the assembly language Programs of 8051 microcontroller to the specific task.
Interface the Stepper moter, traffic light controller, seven segment display with 8051 Microcontroller.</td></tr>
<tr><td rowspan="3">Course outcomes</td><td>CO1</td><td>AEI-409.1</td><td>Familiarize with 8051 microcontroller kit/keil software.</td></tr>
<tr><td>CO2</td><td>AEI-409.2</td><td>Write the assembly language Programs of 8051 microcontroller to the specific task.</td></tr>
<tr><td>CO3</td><td>AEI-409.3</td><td>Interface the Stepper moter, traffic light controller, seven segment display with 8051 Microcontroller.</td></tr>
<tr><td>Learning Outcomes</td><td></td><td colspan="2">I. Familiarization of Microcontroller kit &keil software.
1). Familiarize with 8051 microcontroller kit
2). Familiarize with 8051 Simulator –KEIL software or (simulator software)..
II. Programming using Microcontroller kit/ KEIL software.
Write an ALP to perform the following task using 8051 Microcontroller.
3). 8-bit addition &subtraction.
4). Multibyte addition.
5). Black transfer of data.
6). Sum of given n numbers.
7). Sum of first n natural numbers.
8). Multiplication of two 8 bit numbers using MUL instruction.
9). To find smallest number from given array of numbers.
10) To sort numbers in ascending order from given array of numbers.
11) Time delay program using counters.
III. Interfacing with 8051 Microcontroller.
12) Interface the push button switch and an LED to a 8051 microcontroller and write a program to turn ON an LED when push button is pressed and turn OFF when push button is released.
13) Interface a seven segment display with 8051 microcontroller and write a program to display a given data.
14) Interface a traffic light controller with 8051 microcontroller and write a program to control the traffic in a 4-way road in a certain period of time.
15) Interface a stepper motor with 8051 microcontroller and write a program to rotate in clockwise / anti-clock wise direction.</td></tr>
</table>

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-409.1	1							3	2	
AEI-409.2				3				3	2	
AEI-409.3					2			3	2	
Average	**1**			**3**	**2**			**3**	**2**	

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

PROCESS CONTROLLAB

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-410	Process control lab	3	45	40	60

S. NO	Major Topics	No. of Periods	COs Mapped
I	P,PI,PID Control Modes	21	CO1
II	Open loop and Closed loop Response	6	CO2
III	I/P & P/I Converters	9	CO3
IV	Control Valves	9	CO4
	TOTAL	**45**	

Upon completion of the course the student shall be able to			
Course Objectives		(i)	Observe the P,PI,PID control actions of pressure ,flow, level and temperature processes.
		(ii)	Obtain open loop and closed loop response of pressure control loops.
		(iii)	Perform an experiment to convert I/P & P/I and to plot the characteristics
		(iv)	Plot the flow-lift characteristics of Linear, Quick opening and Equal percentage control valves
Course outcomes	CO1	**AEI-410.1**	Observe the P,PI,PID control actions of pressure ,flow, level and temperature processes.
	CO2	**AEI-410.2**	Obtain open loop and closed loop response of pressure control loops.
	CO3	**AEI-410.3**	Perform an experiment to convert I/P & P/I and to plot the characteristics
	CO4	**AEI-410.4**	Plot the flow-lift characteristics of Linear, Quick opening and Equal percentage control valves

Learning Outcomes		**I. P,PI,PID Control Modes** 1. Observe the action of the following control modes to pressure process i) Proportional Control ii) Proportional Integral Control iii) Proportional Integral & Derivative Control 2. Observe the action of the following control modes to flow process i) Proportional Control ii) Proportional Integral Control iii) Proportional Integral & Derivative Control 3. Observe the action of the following control modes to level process i) Proportional Control ii) Proportional Integral Control iii) Proportional Integral & Derivative Control 4. Observe the action of the following control modes to temperature process i) Proportional Control ii) Proportional Integral Control iii) Proportional Integral & Derivative Control **II. Open loop and Closed loop Response** 5. Obtain open loop and closed loop response of pressure control loop **III. I/P & P/I Converters** 6. Perform an experiment to convert current (4-20mA) to Pressure(3-15 psi) using I/P converter and plot the characteristics between input current and output pressure. 7. Perform an experiment to convert Pressure(3-15 psi) to current (4-20mA) using P/I converter and plot the characteristics between input pressure and output current. **IV. Control Valves** 8. Plot the flow- lift characteristics of the following i) Linear control valve ii) Quick opening control valve iii) Equal percentage control valve

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-410.1	*3*	*1*			*1*			*3*	*2*	*1*
AEI-410.2	*1*	*1*			*1*			*3*	*2*	*1*
AEI-410.3	*1*	*1*			*1*			*3*	*2*	*1*
AEI-410.4	*1*	*1*			*1*			*3*	*2*	*1*
Average	***1.5***	***1***			***1***			***3***	***2***	***1***

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

ANALYTICAL INSTRUMENTATION LAB

Course code	Course title	Total no. of periods	Marks for FA	Marks for SA
AEI-411	**ANALYTICAL INSTRUMENTATION LAB**	45	40	60

S.NO	Major Topics	No. of Periods	COs Mapped
I	Spectro photometers	12	CO1
II	Flame Photo Meter	6	CO2
III	Dissolved Oxygen Meter	3	CO3
IV	Refractometer	6	CO4
V	Polarimeter	6	CO5
VI	Measurement of pH&Conductivity	12	CO6
	Total	45	

Upon completion of the course the student shall be able to

Course Objectives		(i) (ii)	Familiarize with the use of analytical instruments Measure the valve of pH and conductivity using pH meter and conductivity meter.
Course outcomes	CO1	AEI-411.1	Analyze the composition of the given sample using Spectro Photo Meters
	CO 2	AEI-411.2	Use flame photometer to determine the presence of metal in a given sample
	CO 3	AEI-411.3	Use Dissolved oxygen meter to determine the dissolved Oxygen in given sample
	CO 4	AEI-411.4	Find out the refractive index of the given sample using refractometer
	CO 5	AEI-411.5	Find the concentration of a given sample using Polarimeter
	CO 6	AEI-411.6	Measure the p^H value of the given solution using p^H meters and conductivity using conductivity meter.
Learning Outcomes			**I. SPECTRO PHOTO METERS.** **1.** Analyze the composition of the given sample using UV Spectro Photo M **2.** Analyze the composition of the given sample using IR Spectro Photo Me **3.** Analyze the composition of the given sample using Visible Spectro Photo **II. FLAME PHOTO METER** **4.** Using Flame Photo Meter, determine the presence of metal in a given sa **III. DISSOLVED OXYGEN METER** **5.** Determine the dissolved Oxygen in given sample using Dissolved oxyge **IV. REFRACTOMETER** **6.** Find out the refractive index of the given sample using refractometer. **V. POLARIMETER**

		7. Find the concentration of a given sample using Polarimeter **VI. MEASUREMENT OF p^H &CONDUCTIVITY** **8.** Measure the p^H value of the given solution using p^H meter using a) Analog p^H meter b) Digital p^H meter **9.** Measure the conductivity of a given sample using conductivity meter.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-411.1	2				1			3	2	
AEI-411.2	1				1			3	2	
AEI-411.3	1				1			3	2	
AEI-411.4	1			1				3	2	
AEI-411.5	1			1				3	2	
AEI-411.6	2			2				3	2	1
Average	**1.33**			**1.33**	**1**			**3**	**2**	**1**

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

V SEMESTER

DIPLOMA IN APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS

CURRICULUM-20

V SEMESTER

Subject Code	Name of the Subject	Instruction periods / week		Total Periods /semester	Scheme of Examination			
		Theory	Practicals		Duration (hours)	Sessional Marks	EndExam Marks	Total Marks
THEORY								
AEI-501	IM&ST	4	-	60	3	20	80	100
AEI-502	Biomedical Instrumentation	5		75	3	20	80	100
AEI-503	Control Systems	5		75	3	20	80	100
AEI-504	Industrial Automation	5		75	3	20	80	100
AEI-505	Instrumentation in Process Industries	4		60	3	20	80	100
AEI-506	Communication Engineering	4		60	3	20	80	100
PRACTICAL								
AEI-507	Biomedical Instrumentation Lab		3	45	3	40	60	100
AEI-508	Life skills		3	45	3	40	60	100
AEI-509	PLC and SCADA Lab		3	45	3	40	60	100
AEI-510	Field Practices		3	45	3	40	60	100
AEI-511	Project Work		3	45	3	40	60	100
TOTAL		27	15	630	-	320	780	1100

AEI-508 common with all branches.

INDUSTRIAL MANAGEMENT & SMART TECHNOLOGIES

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-501	INDUSTRIAL MANAGEMENT & SMART TECHNOLOGIES	04	60	20	80

S No	Chapter/ Unit Title	No. of Periods/ week	COs Mapped
1	Introduction to management and organisation structure	12	CO1
2	Maintenance management & Industrial Safety	12	CO2
3	Personal protective Equipment(PPE)	07	CO3
4	Quality control	07	CO4
5	Smart technologies	12	CO5
6	Entrepreneurship Development	10	CO6
	TOTAL	**60**	

Upon completion of the course the student shall be able to			
Course Objectives	(i) (ii) (iii) (iv)	Familiarize the concepts of management and organisation structure and importance of Maintenance Management & Industrial Safety Usethe need of Personal Protective Equipment and explain the different PPEs. Familiarise the importance of quality control in an industry and smart technologies Familiarise the role of entrepreneur in economic development and in improving the quality of life.	
Course outcomes	CO1	**AEI-501.1**	Explain the Organisation Structure & organisational behaviour
	CO2	**AEI-501.2**	Explain the importance of Maintenance Management & Industrial Safety
	CO3	**AEI-501.3**	State the need of Personal Protective Equipment and explain the different PPEs.
	CO4	**AEI-501.4**	State the importance of quality control in an industry and explain the key elements of quality control.
	CO5	**AEI-501.5**	Explain smart technologies.
	CO6	**AEI-501.6**	Explain the role of entrepreneur in economic development and in improving the quality of life.

1.0 **Introduction to management and Organisation Structure**

1.1 State the importance of management.
1.2 Explain the functions of management.
1.3 State the principles of management by Henry fayol.
1.4 Explain the principles of scientific management.
1.5 State the need of organisation structure in an industry.
1.6 Explain the line, staff and Functional organizations.
1.7 State the Authority and Responsibility Relationships
1.8 State the differences between Delegation and decentralization
1.9 State the factors of effective organisation.
1.10 Explain the process of effective communication.
1.11 List different leadership models.
1.12 State the need of motivation and list different theories of motivation.
1.13 Explain the process of decision making.
1.14 Explain Human resource requirements.
1.15 Explain Job analysis, Job description and job specifications
1.16 Explain the process of recruitment, selection, training and development
1.17 List types of business ownerships(Sole proprietorship, Partnership, Joint Stock Companies ,PSU's , Cooperatives) and differentiate between them.
1.18 State the objectives of Employee participation in management.
1.19 Define social responsibility and corporate social responsibility.

2.0 Maintenance Management & Industrial Safety

2.1 State the importance of maintenance management in Industry.
2.2 List the objectives of maintenance management
2.3 List the types of maintenance in an industry.
2.4 Explain scheduled maintenance
2.5 Explain breakdown maintenance.
2.6 Explain the principles of 5 s for good house keeping
2.7 State the importance of safety at workplace..
2.8 State important provisions related to safety.
2.9 Define the terms hazard and accident.
2.10 List different hazards in the Industry.
2.11 Explain the causes of accidents.
2.12 Explain the direct and indirect cost of accidents.

3.0 Personal Protective Equipment(PPE)

3.1 Define the term PPE.
3.2 State the the need of PPE in an industry.
3.3 List the types of PPE.
3.4 Name the non respiratory protective equipment.
3.5 Explain the following non respiratory protective equipment used in an industry.

(i)	Head protection	(ii)	Face and eye protection
(iii)	Hand and arm protection	(iv)	Foot and leg protection
(v)	Body protection	(vi)	Hearing protection

3.6 State the need of respiratory protective equipment (RPE).
3.7 List the types of RPE.
3.8 Explain the following respiratory protective equipment (RPE).

(i)	Gas Masks	(ii)	Air purifying respirators
(iii)	Chemical cartridge respirators	(iv)	Supplied air respirators
(iv)	Self contained breathing apparatus		

4.0 **Quality Control**

4.1 Define the term quality control with respect to an industry.
4.2 State the importance of quality control in an industry.
4.3 List and explain the key elementsof quality control.
4.4. Define the term quality assurance.
4.5 State the difference between quality control and inspection..
4.6 State the use of X-ray fluorescence machine in quality control of cement in cement industry.

5.0 **Smart Technologies**

5.1 Define the term*Internet of Things* (IoT).
5.2 Explain the concept of IoT.
5.3 List the key features ofIoT.
5.4List the components of IoT : hardware, software, technology andprotocols.
5.5 List the advantages and disadvantages ofIoT.
5.6 List the applications of IoT.
5.7 Explain the application of IoT in the context of SmartCities.
5.8 Explain the application of IoT in the context of Smart Energy and the SmartGrid.
5.9 Explain the application of IoT in the context of Smart Transportation andMobility.
5.10 Explain the application of IoT in the context of Smart Home, Smart Buildings and Infrastructure.
5.11 Explain the application of IoT in the context of Smart Factory and Smart Manufacturing.
5.12 Explain the application of IoT in the context of SmartHealth.
5.13 Explain the application of IoT in the context of Food and Water Tracking and Security.
5.14 Explain the application of IoT in the context of Social Networks.

6.0 **Entrepreneurship Development.**

6.1 Define the word entrepreneur.
6.2 Explain the requirements of an entrepreneur.
6.3 State the role of entrepreneurs in promoting Small Scale Industries.
6.4 Explain the details of self-employment schemes.
6.5 Explain the characteristics of successful entrepreneurs.
6.6 Explain the method of site selection.
6.7 List the financial assistance programmes.
6.8 List out the organisations that help an entrepreneur.
6.9 Explain the use of EDP Programmes.
6.10 State the concept of make in India, Zero defect and zero effect.
6.11 Explain the importance of start-ups.
6.12 State the need for demand surveys.
6.13 State the need for market survey.
6.14 State the necessity of evaluating Economic and Technical factors.
6.15 State the need to prepare feasibility report.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-501.1	1	1						2	1	1
AEI-501.2	1	1			1			2	1	1
AEI-501.3	1	1						2	1	1
AEI-501.4	1	1						2	1	1
AEI-501.5	1	1			1			2	1	1
AEI-501.6	1	1						2	1	1
Average	**1**	**1**			**1**			**2**	**1**	**1**

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENT

1.0 Introduction to management and Organisation Structure

Management,functions, principles,scientific management, Organization structure- Line, Staff and functional Organizations- Authority and responsibility-Decentralization and Delegation, Effective Organisation; Communication, ; Leadership Models; motivation theories; Decision making, Human resource requirements; Forms of Business ownerships: Types – Sole proprietorship, Partnership, Joint Stock Companies, PSU's, Cooperatives types of Organizations; Employee participation in management;social responsibility, Corporate Social responsibility;

2.0 Maintenance Management & Industrial Safety

Objectives and importance of plant maintenance, Different types of maintenance, Scheduled and Breakdown maintenance, 5 S principles; Importance of Safety at work places;Provisions related to safety, Hazard and Accident- Causes of accidents, direct and indirect costs of accidents.

3.0 Personal protective Equipment(PPE)

Definition, Need and types of PPE, Non respiratory and respiratory protective equipments.

4.0 Quality control

Definition, importance and elements of quality control, use of X-ray fluorescence machine in quality control of cement in cement industry.

5.0 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 Cities, Smart Energy and the Smart Grid, Smart Transportation and Mobility, Smart Home, Smart Buildings and Infrastructure, Smart Factory and Smart Manufacturing, Smart Health, Food and Water Tracking and Security, Social Networks and IoT.

6.0 Entrepreneurship Development.

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, Entrepreneurial development schemes; financial assistance programmes; Market survey and Demand survey; Preparation of Feasibility study reports

REFERENCE BOOKS

1. O.P Khanna - Industrial Engineering and Management
2. AK.Guptha-Industrial safety and environment(For UNIT-3)
3. Converging_Technologies_for_Smart_Environments_and_Integrated_Ecosystems_IERC_Book_Open_Access_2013 pages-54-76

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Sl No	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	Introduction to management and organisation structure	12	17	9	8			3	1			CO1
2	Maintenance management & Industrial Safety	12	14	6	8			2	1			CO2
3	Personal protective Equipment(PPE)	07	11	3	8			1	1			CO3
4	Quality control	07	7	3	4			1	1/2			CO4
5	Smart technologies	12	10	6	4			2	1/2			CO5
6	Entrepreneurship Development	10	11	3	8			1	1			CO6
	Higher order question from unit 1 or 5		10			10				1		CO2, CO5
Total		60	80	30	40	10	-	10	5	1	-	-

Table specifying 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 4.1 to 6.15

C-20-AEI-501

BOARD DIPLOMA EXAMINATION, (C-20)

DAEIE- FIFTH SEMESTER EXAMINATION

INDUSTRIAL MANAGEMENT AND SMART TECHNOLOGIES

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. State the factors of effective organization. (CO1)
2. Define corporate social responsibility. (CO1)
3. Write any three differences between proprietorship and partnership. (CO1)
4. State the importance of maintenance management in an industry. (CO2)
5. Define the term Hazard. (CO2)
6. State the need of PPE in an industry. (CO3)
7. State the importance of quality control in an industry. (CO4)
8. List the components of IoT. (CO5)
9. Write any three advantages of IoT. (CO5)
10. List any three financial assistance programmes. (CO6)

PART- B

5×8=40

Instructions: 1) Answer either (A) or (B) from each question, each question carries Eight marks.
2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A). Explain the functions of management. (CO1)

or

(B). Explain the process of decision making. (CO1)

12. (A). Explain the need for scheduled maintenance. (CO2)

or

(B). Explain the direct and indirect costs of accidents in an industry. (CO2)

13. (A). Explain any two non-respiratory protective equipment. (CO3)

Or

(B). Explain any two respiratory protective equipment. (CO3)

14. (A). i) Explain the elements of quality control. (CO4) 4M

ii) Explain the concept of IoT. (CO5) 4M

Or

(B). i)Explain the application of IoT in the context of smart health. (CO5) 4M

ii) Differentiate between Quality control and Inspection. (CO4) 4M

15. (A). Explain the importance of start-ups. (CO6)

Or

(B). Explain any four self employment schemes. (CO6)

PART- C **1×10=10**

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

16. Explain Line and staff organisational structure with line diagram and explain how it is useful. (CO1)

***

DAEIE- FIRST UNIT TEST

MODEL QUESTION PAPER(C-20)

INDUSTRIAL MANAGEMENT AND SMART TECHNOLOGIES (AEI-501)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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 i) Define management.. (CO1) **4X1M=4M**

ii) The father of management is_____ (CO1)

iii) Hearing protection is releted to _____type of PPE in industry. (CO3)

iv) Supplied air resistors are releted to _____ type of PPE in industry. (CO3)

2. List different hazards in industry. (CO2) 3M

3. Define the term PPE. (CO3) 3M

4. List the types of business ownerships. (CO1) 3M

5. Define social responsibility. (CO1) 3M

PART- B

3×8M=24M

Instructions: Answer either (A) or (B) from each question and each question carries Eight marks.

6. (A). Explain line organization with a legible sketch. (CO1)

Or

(B). Explain the process of job analysis. (CO1)

7. (A). Explain the principles of 5s for good housekeeping. (CO2)

Or

(B). Explain the causes of accidents (CO2)

8. (A). Explain PPE related to heat protection and body protection. (CO3)

Or

(B). Explain PPE related to gas masks and air purifying respirators. (CO3)

***

BIO MEDICAL INSTRUMENTATION

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-502	**BIO MEDICAL INSTRUMENTATION**	5	75	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Introduction to bio-medical Engg.	10	CO1
2	Diagnostic Medical Instruments	15	CO2
3	Blood pressure and blood flow Measurements	12	CO3
4	Therapeutic Instruments	12	CO4
5	Modern Imaging Systems	15	CO5
6	Patient monitoring system and patient safety	11	CO6
	TOTAL	75	

Upon completion of the course the student shall be able to			
Course Objectives	(i)	familiarize with knowledge of bio-medical Engineering, Diagnostics Instruments, Blood Pressure and blood flow measurements, bio-medication equipment	
Course outcomes	CO1	AEI-502.1	Explain different electrodes used for ECG, EEG and EMG
	CO2	AEI-502.2	Analyse the ECG, EEG,and EMG Waveforms
	CO3	AEI-502.3	Explain the working of blood pressure and blood flow measurements
	CO4	AEI-502.4	Explain the working of therapeutic medical instruments.
	CO5	AEI-502.5	Explain the working of modern image and patient monitoring system and safety of patient
	CO6	AEI-502.6	Explain the patient monitoring system and safety of a patient

Learning Outcomes	**1.0 Introduction to bio-medical Engineering** 1.1 Define bioelectric potentials. 1.2 Define resting and action potentials. 1.3 Explain resting and Action potentials with waveform. 1.4 Explain about Sodium pump and transmission of impulses. 1.5 Define an electrode. 1.6 List the types of electrodes used for bioelectric potentials measurement. 1.7 Explain the different types of electrodes used for ECG, EEG and EMG. 1.8 Explain the electrical activity of heart. 1.9 Explain the bio-electrical potentials associated with muscle activity. 1.10 Explain the electrical activity of Brain. 2.0 **Diagnostic medical Instruments.** 2.1 List the Diagnostic Medical Equipments. 2.2 Draw and explain the building Blocks of an electro cardio graph (ECG). 2.3 Draw and explain the ECG Lead Configurations (Bipolar & Unipolar). 2.4 Compare bipolar and unipolar leads used for ECG measurement. 2.5 Draw the electrocardiogram. Indicate its amplitude and duration and state their importance. 2.6 List the applications of ECG. 2.7 Explain the arrangement of electrodes while monitoring EEG. 2.8 Analyse the EEG waveformand explain the principle of EEG machine with block diagram. 2.9 Classify the EEG frequency bands. 2.10 List the applications of EEG. 2.11 Draw the block diagram set up for EMG recording. 2.12 Mention the frequency and amplitude of EMG. 2.13 List the applications of EMG. 3.0 **Blood Pressure and blood flow measurements.** 3.1 List the types of direct blood pressure measurements (catheterization, percutaneous insertion and implantation of transducer in a vessel). 3.2 Explain the above three methods with suitable diagrams. 3.3 List the types of indirect blood pressure measurements. 3.4 Explain indirect blood pressure measurement using sphygmomanometer and Stethoscope. 3.5 Explain the working of electromagnetic blood flow meter with diagram 3.6 Explain the working of Ultrasonic blood flow meter based on transit time with diagram. 3.7 Explain the working of Ultrasonic blood flow meter based on Doppler type with diagram. 3.8 Explain with a block diagram the operation of LASER Doppler Blood flow meter.

	4.0 **Therapeutic instruments** 4.1 State the need of pacemaker. 4.2 Classify different types of pacemakers. 4.3 Compare the internal pacemakers over external pacemakers. 4.4 List the types of Pacing modes. 4.5 Draw the block diagram of a ventricular synchronous demand pacemaker and explain its operation. 4.6 State the need of defibrillators. 4.7 Draw and explain the circuit diagram of AC defibrillators. 4.8 Draw and explain the circuit diagram of capacitive discharge DC defibrillators. 4.9 Compare AC defibrillators and DC defibrillators. 4.10 Define dialysis. 4.11 State the importance of dialysis. 4.12 List the functions of dialysis machine. 5.0 **Modern Imaging Systems.** 5.1 X-Ray imaging 1. List the properties of X-Ray. 2. Explain the interaction of X-Ray with matter. 3. Define Compton Effect. 4. Explain the Production of X-Rays with a diagram. 5. State the need for grid. 6. List the applications of X-rays. 7. List the limitations of X-rays. 5.2 Explain the operation of an X-ray machine with block diagram. 5.3 Explain the working of C.A.T Scanner with block diagram. 5.4 List the advantages of C.A.T imaging over X-ray imaging. 5.5 Explain the working of M.R.I with block diagram. 5.6 List the advantages of M.R.I. 5.7 List the applications of M.R.I. 6.0 **Patient monitoring system and patient safety**. 6.1 Explain patient monitoring in ICU and draw the system of arrangement. 6.2 Explain the effects of electrical current, magnetism and electromagnetic radiations on human body. 6.3 Define micro and macro shock. 6.4 Differentiate between micro shock and macro shock. 6.5 List the preventive measures to reduce shock hazards. 6.6 List the general and safety requirements of electro medical equipment issued by Bureau of Indian Standards (BIS).

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-502.1	1	1						2	2	1
AEI-502.2	1	1						2	2	1
AEI-502.3	1	1			1			2	2	1
AEI-502.4	1	1			1			2	2	1
AEI-502.5	1	1			1			2	2	1
AEI-502.6	1	1			1			3	2	1
Average	**1**	**1**			**1**			**2.16**	**2**	**1**

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENTS

1.0 **Introduction to Biomedical Engineering:** Bioelectric potentials–Resting and action potential, sodium pump, transmission of impulses, Electrodes used for Bio potential measurement, Electrical activity of the heart, Electrical Activity of the muscles- Electrical Activity of the brain.

2.0 **Diagnostic Medical Instruments**: Electro cardio graph (ECG) – Block diagram; ECG waveform, Electro encephalograph (EEG) –Block diagram, EEG wave forms, Electro mayo graph (EMG) – Block diagram, EMG Wave form .

3.0 **Blood Pressure and Blood Flow Measurements:** Direct and indirect Blood pressure measurement, Blood Flow meters - Electromagnetic, Ultrasonic and Laser Doppler Blood flow meters.

4.0 **Therapeutic Instruments:** Pacemakers - Need of Cardiac Pacemakers, internal and external pacemakers, differences between internal and external pacemakers, Ventricular synchronous demand pacemaker, Defibrillation-need of defibrillator, AC and DC defibrillator, dialysis-importance and functions of dialysis machine.

5.0 **Modern Imaging Systems:** X-Rays - Properties, interaction, production of X-rays, Compton Effect, need for a grid, Applications, Limitations of X-Ray imaging, operation of an X-Ray machine, C.A.T. Scanner – operation, advantages and applications, M.R.I- operation, advantages and applications.

6.0 Patient Monitoring system and patient safety: Patient monitoring in ICU, Physiological effects of electricity, Electromagnetic radiation and magnetism on human body. Shocks-micro and macro shocks, Preventive measures of shock. Safety requirement by BIS.

REFERENCE BOOKS

1. R.S.Kandpur -Hand Book of Biomedical Instrumentation , Tata Mcgraw Hill.
2. Leslie Cromwell & Fred .J. Weibell and Erich A.Preiffer -Biomedical Instrumentation and Measurements , PHI.
3. Dr. Arumugham -Biomedical Instruments
4. L.A.Taddes & Baker- Principles of Applied Bio medical Instrumentation
5. John.G.Webster- Medical Instrumentation
6. Levine - Advanced Biomedical Engineering
7. LELE- Computer the Machine, Tata McGraw Hill Co.,
8. Joseph Carr & Joseph Brown- Introduction to Biomedical equipment Technology

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S. No	*Major Topics*	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Introduction to bio-medical Engg.	10	14	6	8			2	1			CO1
2	Diagnostic Medical Instruments	15	14	6	8			2	1			CO2
3	Blood pressure and blood flow Measurements	12	11	3	8			1	1			CO3
4	Therapeutic Instruments	12	11	3	8			1	1			CO4
5	Modern Imaging Systems	15	14	6	8			2	1			CO5
6	Patient monitoring system and patient safety	11	6	6	-			2	-			CO6
	Higher order question from chapters 2		10							1		CO2
	Total	75	80	30	40	-	-	10	5	1	-	-

Table specifying 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 4.1to 6.6

C-20-AEI-502

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- FIFTH SEMESTER EXAMINATION
BIO MEDICAL INSTRUMENTATION

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. Define bioelectric potential (CO1)
2. Define an electrode. (CO1)
3. List different diagnostic Medical Equipment. (CO2)
4. Classify the EEG frequency bands. (CO2)
5. Mention the types of direct Blood pressure measurement. (CO3)
6. Classify the types of Pacemakers. (CO4)
7. List the advantages of C.A.T imaging over X-ray imaging. (CO5)
8. Define Compton effect. (CO5)
9. Define Micro shock and Macro shock. (CO6)
10. List the preventives measures to reduce shock hazards. (CO6)

PART- B

5×8=40

Instructions: (1) Answer either (A) or (B) from each question, each question carries Eight marks.
(2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A). Explain sodium pump and transmission of impulses. (CO1)

Or

(B). Explain electrical activity of brain (CO2)

12. (A). Draw and explain the building blocks of an electro Cardiogram. (CO3)

Or

(B). Draw the block diagram set up for EMG recording (CO3)

13.(A).Explain the working of LASER Doppler Blood flow meter with Diagram. (CO4)

Or

(B). Explain the working of Ultrasonic transmittype Blood flow meter with Diagram. (CO4)

14. (A). Draw and explain the circuit diagram of capacitive discharge DC Defibrillators. (CO5)

or

(B). Draw and explain the block diagram a ventricular synchronous demand pacemaker. (CO5)

15. (A). Explain the working of MRI with block diagram. (CO6)

or

(B). Explain the operation of an X-ray machine with block diagram. (CO6)

PART- C

1×10=10

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

16. Analyse the EEG waveformand explain the principle of EEG machine with block diagram. (CO2)

***

DAEIE- FIRST UNIT TEST

MODEL QUESTION PAPER(C-20)
BIO MEDICAL INSTRUMENTATION- (AEI-502)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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.i) Study of electrical activity of brain is called ------ 4X1M=4M

ii) Sphygnomanometer is used to measure the activity of heart . (True/False)

iii) Source of bioelectric potential is ionic in nature. (True/False)

iv) ----is an electrode for measuring EMG.

2. Define resting potential. 3M

3. List the applications of ECG. 3M

4.List the types of indirect blood pressure measurements. 3M

5. Classify the EEG frequency bands. 3M

PART- B

3×8M=24M

Instructions: Answer either (A) or (B) from each question and each question carries Eight marks.

6. (A). Explain the bio-electrical potentials associated with muscle activity.

Or

(B). Explain the different types of electrodes used for ECG .

7. (A). Explain the working principle of an EEG machine with Block diagram.

Or

(B). Draw and explain the ECG Lead Configurations (Bipolar & Unipolar).

8. (A). Explain the working of electromagnetic blood flow meter with diagram.

or

(B). Explain the working of Ultrasonic blood flow meter based on Doppler type with diagram.

***

CONTROL SYSTEMS

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-503	Control Systems	05	75	20	80

S.No	Chapter/ Unit Title	No. of Periods	COs Mapped
1	Introduction to Control system	10	CO1
2	Transfer functions	17	CO2
3	Block Diagram algebra & Signal flow graphs	10	CO3
4	Time Domain Analysis	18	CO4
5	Frequency Domain Analysis	20	CO5
	TOTAL	**75**	

Upon completion of the course the student shall be able to

Course Objectives	1. Explainthe importance of Control System Engineering in industry
	2.Evaluate the transfer Functions of system using block diagram algebra and signal flow graphs
	3.Analyze the system in Time & Frequency Domains and to evaluate its stability

Course Outcomes	**CO1**	AEI-503.1	Explain the use of Control System Engineering in day to day life and industry
	CO2	AEI-503.2	Obtain the transfer Functions for different circuits
	CO3	AEI-503.3	Evaluate the system transfer function using block diagram algebra and signal flow graphs
	CO4	AEI-503.4	Time Domain analysis to predict and diagnose transient performance of the system for standard input functions.
	CO5	AEI-503.5	Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

LEARNING OUTCOMES:

1.0 Introduction to Control System

1.1 Define system and control system.

1.2 State the importance of control engineering in day to day life and industry.

1.3 Define open loop and closed loop control systems.

1.4 Explain open loop and closed loop control systems with examples of water level controller and Temperature controller.

1.5 Distinguish between open loop and closed loop control system.

1.6 Explain the following systems with example

a. Linear and Non-linear control system.

b. Time variant and time invariant system.

c. Continuous data and discrete data system.

d. Digital control systems

2.0 Transfer Functions

2.1 Define Transfer Function.

2.2 List the properties and limitations of transfer functions of system.

2.3 Define Laplace Transform of the function.

2.4 Obtain the Laplace transforms of

(i) unit step (ii) unit ramp (iii) unit impulse (iv)e^{at}

(v) te^{at} (vi)sin at (vii)cos at (viii)e^{at} sin at (ix) t^n

2.5 State and prove initial value theorem and final value theorem.

2.6 Define inverse Laplace transform.

2.7 Obtain the inverse Laplace transforms of following functions.

i) F(s) = 1/s, ii) F(s) = 1/(s+a), iii) F(s) = a/s(s+a), iv) $F(s) = \omega/(s^2+ \omega^2)$,

v) $F(s) = s/(s^2+ \omega^2)$, vi) $F(s) = \omega/((s+a)^2+ \omega^2)$,

2.8 Derive the transfer functions of RLC series and RLC parallel circuits.

3.0 Block diagram algebra and signal flow graphs

3.1. Define block diagram of the system.

3.2 List the basic components of the block diagram.

3.3 Mention the Rules for Block diagram reduction.

3.4 Solve simple Problems on block diagram reduction.

3.5 Define the signal flow graph ofthe system.

3.6 State the Mason's Gain formula.

3.7 Explain Mason's Gain formula with an example.

3.8 Solve problems to determine the transfer function using Mason's Gain formula.

4.0 Time Domain Analysis

4.1 Define the term time response of a system.

4.2 List the test signals in control system.

4.3 Obtain the time response of first order system for a unit step and unit impulse input.

4.4 Obtain the time response of second order system for a unit step input.

4.5 List the time domain specifications of second order system and define them.

4.6 Define Type and Order of a control system.

4.7 Define type 0, Type 1 and Type 2 control systems.

4.8 Obtain static error coefficients K_P, K_V, K_A.

4.9 Obtain steady state error for Type 0, Type 1 and Type 2 systems

4.10 Simple problems on the above systems.

5.0 Frequency Domain Analysis

5.1 Define absolute and relative stability.

5.2 Define frequency response of a system.

5.3 List the frequency response plots.

5.4 State and explain Routh Hurwitz criterion for stability of a system.

5.5 Find the stability of a system using Routh Hurwitz criterion (simple problems).

5.6 Define Bode plot.

5.7 Explain the procedure for magnitude plot of Bode plot.

5.8 Explain the procedure for phase plot of Bode plot.

5.9 Define Gain margin and Phase margin.

5.10 Obtain bode plots for the following transfer functions:

i. G(s) = K ii) G(s) = K/s iii) G(s) = K/(1+sT)

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-503.1	1	1						2	2	1
AEI-503.2	1	1						2	2	1
AEI-503.3	1	1			1			2	2	1
AEI-503.4	1	1			1			2	2	1
AEI-503.5	1	1			1			2	2	1
Average	**1**	**1**			**1**			**2**	**2**	**1**

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENTS

1. **Basic Concepts of Control Systems:** Definition of system and Control, controlled variable, manipulated variable, controller, Different types of control systems.
2. **Transfer functions:** Definition of transfer function and its properties. Definition of Laplace transform, Laplace transforms of standard time functions, Inverse Laplace transforms– problems on Inverse Laplace transforms - the transfer functions of RLC series and RLC parallel circuits.

3. **Block diagram algebra and signal flow graph:**
   Block diagram reduction – rules for block diagram reduction, Signal flow graph and Mason's Gain formula**.**

4. **Time Domain analysis:** Transient response of first ordersystem for step input, Impulse input-step response of II order system andspecifications .Type and order of a system – Type 0, Type 1 and Type 2 control systems– error coefficients .
5. **Frequency Domain analysis:**
   Relative and absolute stability -Routh Hurwitz criterion, bode plot.

REFERENCE BOOKS:

1. Katsuhiko Ogata ,2002, Modern Control Engineering, Vol.4 London.
2 B.S.Manke, 2005, Linear Control Systems, Khanna Publishers
3. Nagrath, I. J., and Madan Gopal,2008, Control systems, New Age International
4. Nagoor&Khani, 2016, Control system Engineering, RBA Publication -

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Sl	Chapter/	No of	Weightag	Marks Wise	Question Wise	COs

No	Unit Title	Periods	e Allotted	distribution of weightage				distribution of weightage				mapped
				R	U	Ap	An	R	U	Ap	An	
1	Introduction to Control system	10	14	6	8			2	1			CO1
2	Transfer functions	17	14	6	8			2	1			CO2
3	Block Diagram algebra & Signal flow graphs	10	14	6	8			2	1			CO3
4	Time Domain Analysis	18	14	6	8			2	1			CO4
5	Frequency Domain Analysis	20	14	6	8			2	1			CO5
	Higher order question from chapters 2 or 3 or 4 or 5		10				10				1	CO2, CO4, CO5
Total		75	**80**	30	40	-	10	10	5	-	1	-

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 3.4
Unit Test-II	From 3.5to 5.10

DAEIE- FIFTH SEMESTER EXAMINATION

CONTROL SYSTEMS

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. State the importance of control engineering in day to day life and industry in any three aspects. (CO1)
2. Distinguish between open loop and closed loop control system in any three aspects.(CO1)
3. Define Transfer Function. (CO2)
4. State initial value theorem and final value theorem. (CO2)
5. State the Mason's Gain formula. (CO3)
6. Define block diagram of a system. (CO3)
7. List any three test signals in control system. (CO4)
8. Define Type and order of a control system. (CO4)
9. List three frequency response plots. (CO5)
10. Define Gain margin. (CO5)

PART- B

5×8=40

Instructions: (1) Answer either (A) or (B) from each question, each question carries Eight marks.
(2) Answers should be comprehensive and criterion for valuation is the content but notthe length of the answer.

11. (A). Explain open loop and closed loop control systems with example of water level controller. (CO1)

or

(B). Explain Time variant and time invariant system with an example. (CO1)

12. (A). Obtain the Laplace transforms of (i) e^{at} sin at (ii) t^n (CO2)

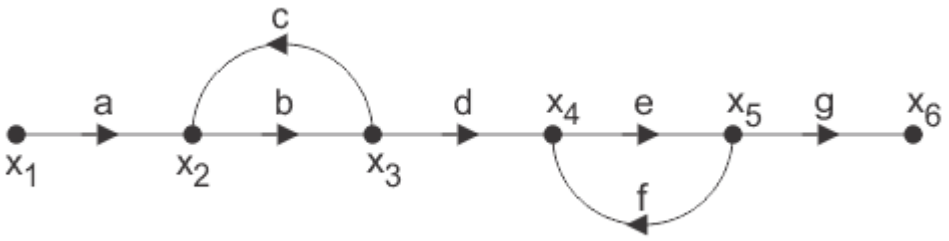
or

(B). Derive the transfer function of RLC series circuit. (CO2)

13. (A). Mention any four rules for block diagram reduction. (CO3)

Or

(B). Find the transfer function for given signal flow graph (CO3)



14. (A). Obtain the time response of second order system for a unit step input. (CO4)

Or

(B). Obtain the time response of first order system for a unit impulse input. (CO4)

15. (A). State and explain Routh Hurwitz criterion for stability of a system . (CO5)

Or

(B). Explain the procedure for magnitude plot of Bode plot. (CO5)

PART- C

1×10=10

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

16. Sketch the Bode plot for the following transfer function G(s) = K/(1+sT). (CO5)

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)
CONTROL SYSTEMS (AEI-503)

Time: 90 Mins. Total Marks: 40M

PART- A Total: 16M

Instructions: (1) Answer all questions.
(2) First question carries four marks and each of rest carries three 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. i) Define system. (CO1) 4X1M=4M
ii)Transfer function of a system is defined as the ratio of output to input is ---(CO2)
iii)Which system is also known as automatic control system. (CO1)
iv)In an open loop system , neither output nor any other variable has an effect on input.(T/F) (CO1)
2. Define open loop and closed loop control systems (CO1) 3M
3. Obtain the Laplace transform of unit ramp input. (CO2) 3M
4. Define inverse Laplace transform. (CO2) 3M
5. List three basic components of a block diagram (CO3) 3M

PART- B

3×8M=24M

Instructions: Answer either (A) or (B) from each question and each question carries Eight marks

6. (A). Explain open loop and closed loop control systems with example of temperature controller. (CO1)

or

(B). Explain Time variant and time invariant system with an example. (CO1)

7. (A). Obtain the inverse Laplace transform of $F(s) = \omega/(s^2+ \omega^2)$. (CO2)

Or

(B). Derive the transfer function of RLC parallel circuit. (CO2)

8. (A). Mention any four rules for block diagram reduction. (CO3)

or

(B). State and prove initial value theorem. (CO2)

***

INDUSTRIAL AUTOMATION

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-504	Industrial Automation	5	75	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Introduction to PLC	15	CO1
2	PLC Programming	20	CO2
3	SCADA	15	CO3
4	Computer Control	15	CO4
5	Embedded systems	10	CO5
	TOTAL	**75**	

Upon completion of the course the student shall be able to			
Course Objectives	(i)	Usethe knowledge of PLC, programming of PLC , SCADA, computer control and Embedded systems.	
Course outcomes	CO1	AEI-504.1	Explain the block diagram of PLC and list the different types of PLCs.
	CO2	AEI-504.2	Draw and explain the ladder diagrams for different logic functions and different applications.
	CO3	AEI-504.3	Familiarize with SCADA.
	CO4	AEI-504.4	Explain the block diagrams of data logger,DAS, DDC, DCS, ROBOT and CNC machine.
	CO5	AEI-504.5	Explain the software and hardware architectures of embedded systems.
Learning Outcomes	**1.0 Introduction to PLC** 1.1 Define automation. 1.2 State the importance of automation. 1.3 Explain Relay based Control panel. 1.4 Define Programmable Logic Controller (PLC) and list the advantages of PLCs. 1.5 Compare Relay based and PLC based Control panel. 1.6 Explain the Block diagram of PLC. 1.7 List different types of PLCs based on I/O's ,memory and configuration		

	1.8 Explain Interfacing of PLC with PC. 1.9 List the manufacturers of PLC. 1.10 List the applications of PLC. **2.0 PLC Programming** 2.1 List different types of PLC programming techniques. 2.2 Define Ladder diagram. 2.3 List the rules to follow in drawing Ladder diagram. 2.4 List and explain PLC Instruction set. 2.5 Draw ladder diagrams for AND, OR, NOT, NAND, NOR, EXOR and EXNOR gates. 2.6 Explain Timers-T ON, T OFF and Retentive timer with ladder diagram. 2.7 Explain Counter instructions -CTU, CTD. 2.8 Explain ladder diagrams on arithmetic and comparison instructions. 2.9 Draw and explain the ladder diagrams for following applications: I. DOL starter and STAR-DELTA starter II. Sequential control of induction motors III. Traffic light controller IV. Level control controller V. Conveyer belt controller. **3.0 SCADA** 3.1 Define SCADA 3.2 Explain the hardware architecture of SCADA. 3.3 List the three main components of a SCADA. 3.4 Explain Remote Terminal Unit of SCADA. 3.5 Explain Master Station of SCADA. 3.6 Explain communication infrastructure of SCADA. 3.7 Explain the creation of graphic symbols using Graphic Display builder. 3.8 Explain Interfacing of SCADA with PLC. 3.9 List the applications of SCADA. **4.0 Computer Control** 4.1 State the role of Computers in Process control. 4.2 Explain the block diagram of Data Logger. 4.3 List the applications of Data Logger. 4.4 Explain the block diagram of Data acquisition system. 4.5 Explain the block diagram of Direct Digital Control System (DDC). 4.6 Define a Robot. 4.7 Explain the operation of simple robot with block diagram. 4.8 List the applications of a Robot. 4.9 Explain CNC Machine with block diagram. 4.10 List the applications of CNC Machine. **5.0 Embedded Systems** 5.1 Define the term Embedded system. 5.2 List the applications of embedded system. 5.3 List the components of Embedded system. 5.4 Explain the hardware architecture of Embedded system. 5.5 Explain the software architecture of Embedded system. 5.6 List the commonly used processors in embedded systems. 5.7 State the need for communication interfaces. 5.8 List the communication interfaces. 5.9 Explain serial communication using USB.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-504.1	*1*	*1*		*1*	*1*			*3*	*2*	
AEI-504.2	*2*	*2*		*2*	*2*			*3*	*2*	
AEI-504.3	*1*	*1*		*1*	*1*			*2*	*2*	
AEI-504.4	*1*	*1*		*1*	*1*			*3*	*1*	*1*
AEI-504.5	*1*	*1*		*1*	*1*			*2*	*2*	*1*
Average	***1.2***	***1.2***		***1.2***	***1.2***			***2.3***	***1.7***	***1***

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENT

1.0 Introduction to PLC

Importance of automation- relay based and PLC based control panel- PLC Definition- Block diagram of PLC- different types of PLCs- different types of PLC manufacturers-Interfacing of PLC with PC.

2.0 PLC Programming

Types of PLC programming- rules for programming -Instruction set- Ladder diagrams for logic functions- Ladder program for DOL starter, Star-Delta Starter, Traffic light control, level control, conveyor controller.

3.0 SCADA

SCADA definition, Architecture and explanation, remote terminal unit, master station, communication infrastructure of SCADA, Graphical symbols used in SCADA, Interfacing of SCADA with PLC, applications of SCADA.

4.0 Computer Control

Role of computers in process control, Data Logger, Data Acquisition, Direct Digital Control System,DCS, Robot and its Applications, CNC Machine.

5.0 Embedded Systems:

Definition of Embedded system, applications, software and hardware architectures, serial Communication using USB.

REFERENCE BOOKS

1. Industrial control engineering by Jacob
2. Industrial automation and process control by Jon Sterenson
3. Programmable Logic controllers by John W.Webb
4. Introduction to PLC by Gary Dunning- Delmar Cengage learning.
5. Embedded Real Time Systems-Dr KVKK Prasad.
6. Computer based industrial control- Krishna Kanth.

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S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Introduction to PLC	15	14	6	8			2	1			CO1
2	PLC Programming	20	14	6		8		2		1		CO2
3	SCADA	15	14	6	8			2	1			CO3
4	Computer Control	15	14	6	8			2	1			CO4
5	Embedded systems	10	14	6	8			2	1			CO5
	Higher order question from chapter 2	--	10			10				1		CO2
	Total	**75**	**80**	**30**	**32**	**18**	**-**	**10**	**4**	**2**	**-**	**-**

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 3.4
Unit Test-II	From 3.5 to 5.9

BOARD DIPLOMA EXAMINATION, (C-20)

DAEIE- FIFTH SEMESTER EXAMINATION

Industrial Automation

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. Define automation . (CO1)
2. List different types of PLCs based on I/O's . (CO1)
3. List different types of PLC programming techniques . (CO2)
4. Mention the rules to follow in drawing Ladder diagram . (CO2)
5. Define SCADA . (CO3)
6. List the three main components of a SCADA. (CO3)
7. List the applications of Data Logger. (CO4)
8. Define a Robot (CO5)
9. List the commonly used processors in Embedded system. (CO6)
10. List the communication interfaces. (CO6)

PART- B

5×8=40

Instructions: (1) Answer either (A) or (B) from each question, each question carries Eight marks.
(2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A). Explain the Block diagram of PLC . (CO1)

or

(B). Explain Relay based Control panel. (CO1)

12. (A). Explain PLC Instruction set . (CO2)

Or

(B). Draw the ladder diagrams & truth tables for AND, OR gates . (CO2)

13. (A). Explain Interfacing of SCADA with PLC. (CO3)

Or

(B). Explain Master Station of SCADA. (CO3)

14. (A). Explain the block diagram of Direct Digital Control System (DDC). (CO4)

Or

(B). Explain the block diagram of Data acquisition system. (CO4)

15. (A). Explain the software architecture of Embedded system. (CO6)

Or

(B). Explain serial communication using USB. (CO6)

PART- C

1×10=10

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

16. Draw and explain the ladder diagram of Conveyer belt controller. (CO2)

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)

INDUSTRIAL AUTOMATION(AEI-504)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions.
(2) First question carries four marks and each of rest carries three 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. i)PLC stands for ------ (CO1) **4X1M=4M**
   ii) SCADA stands for--------- (CO3)
   iii) The part that monitors the input and make decision in a PLC is the CPU. (True/False) (CO1)
   iv) In a PLC I is used for out and O is used for input . (True/False) (CO2)
2. List the manufacturers of PLC. (CO1) 3M
3. Define ladder diagram. (CO2) 3M
4. Draw the ladder diagram of OR gate. (CO2) 3M
5. List the components of SCADA. (CO3) 3M

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) and each question carries Eight marks.

6.(A). Explain the Block diagram of PLC . (CO1)

Or

(B). Explain Interfacing of PLC with PC . (CO1)

7. (A).Draw the ladder diagram of traffic light controller and explain. (CO2)

Or

(B). Drawthe ladder diagram of level controller and explain. (CO2)

8. (A). Explain Relay based Control panel. (CO1)

Or

(B).Draw ladder diagram for Sequential control of induction motor and explain. (CO2)

***

DAEIE-SECOND UNIT TEST
MODEL QUESTION PAPER(C-20)

INDUSTRIAL AUTOMATION(AEI-504)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

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

2. i)DDC stands for ------ (CO4) **4X1M=4M**

ii) SCADA stands for--------- (CO3)

iii) SCADA symbols are placed in ----------tab (CO3)

iv) CNC machine is used for ---------- (CO4)

2. Draw the diagram of Master station. (CO) 3M

3. Draw the diagram of DDC. (CO) 3M

4. List the components of Embedded system.(CO5) 3M

5. List the communication interfaces..(CO5) 3M

PART- B

3×8M=24M

Instructions: (1) Answer either (A) or (B) and each question carryeight marks.

6. (A) Explain Master Station of SCADA. (CO3)

(oR)

(B) Explain Interfacing of SCADA with PLC. (CO3)

7.(a) Explain the block diagram of Data acquisition system (CO4)

(or)

(b) Explain CNC Machine with block diagram (CO4)

8. (a)Explain the software architecture of Embedded system (CO5)

(or)

(b)Explain the hardware architecture of Embedded system (CO5)

INSTRUMENTATION IN PROCESS INDUSTRIES

Course code	Course title	No.of hours per week	Total no. of periods	Marks for FA	Marks for SA
AEI-505	Instrumentation in Process Industries	4	60	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Methods of power generation in Power Plant	07	CO1
2	Instrumentation and control in power Plant	17	CO2
3	Petro Chemical Plant Instrumentation	12	CO3
4	Iron and Steel Plant Instrumentation	12	CO4
5	Pulp and Paper Plant Instrumentation	12	CO5
	TOTAL	**60**	

Upon completion of the course the student shall be able to			
Course Objectives	(i) (ii)	Familiarize with the knowledge of methods of power generation in different power plants like thermal, Hydroelectric, Wind, Solar ,Nuclear Power Plants. Familiarize with the knowledge of instrumentation control in Petrochemical plant, Iron and steel Plant, Pulp and paper plant.	
Course outcomes	CO1	AEI-505.1	Explain the process of power generation in thermal, Hydroelectric, Wind, Solar ,Nuclear Power Plants.
	CO2	AEI-505.2	Explain the Instrumentation and control in power plant .
	CO3	AEI-505.3	Explain the Instrumentation and control in petro chemical plant .
	CO4	AEI-505.4	Explain the Instrumentation and control in Iron and steel Plant.
	CO5	AEI-505.5	Explain the Instrumentation and control in Pulp and paper plant.
Learning Outcomes	**1.0. Methods of power generation in Power Plant** 1.1 List various power generation methods. 1.2 Give the principle of power generation in thermal power plant. 1.3 Draw the general layout of thermal power plant 1.4 Explain the above layout of thermal power plant. 1.5 Explain the process of power generation with the help of diagrams of following		

	a) Hydroelectric power plant b) Wind power plant c) Solar power plant d) Nuclear power plant **2.0 Instrumentation and Control in Power Plant** 2.1 State the Importance of measurement and instrumentation in power plant. 2.2 Draw the block diagram of boiler process in thermal power plant and explain each block. 2.3 Draw and explain a typical combustion system of a boiler. 2.4 List the important variables that need to be measured in thermal power plant. 2.5 List the measuring locations/points and types of sensors instruments in a thermal power plants of the following parameters a) Pressure b) Temperature c) Flow d) Level e) Vibration 2.6 Explain a method of measurement of flow of feed water with a differential pressure transducer diagram. 2.7 Explain single element drum level control of boiler with a diagram. 2.8 Explain steam temperature control single-stage diagram. 2.9 Explain steam/header pressure control with a feed forward-plus-Feedback control diagram. 2.10 Explain series fuel – air ratio control. 2.11 Explain furnace draft control 2.12 Explain the measurement of turbine shaft speed with a toothed-wheel diagram 2.13 Mention the turbine trip conditions. 2.14 Explain eccentricity measurement of turbine with a diagram. **3.0 Petro Chemical plant Instrumentation.** 3.1 Define petroleum refinery. 3.2 Draw the general layout of a Petro chemical plant. 3.3 Explain the above layout of petro chemical plant. 3.4 List basic steps in refinery process (separation, conversion & treatment). 3.5 Define the following unit operations a) Thermal cracking b) Catalytic cracking c) Polymerization d) Alkalization e) Isomerization 3.6 List the bi products of crude oil. 3.7 Define the term distillation column.

	3.8 Define batch distillation and continuous distillation columns. 3.9 Explain the working of batch distillation column with a diagram. 3.10 Explain the working of continuous distillation column with a diagram. 3.11 List various physical parameters to be measured in distillation column. **4.0 Iron and Steel Plant Instrumentation (ISP)** 4.1 Draw flow scheme of pig iron production and explain. 4.2 Draw flow scheme of steel production and explain. 4.3 List raw materials in ISP 4.4 List different types of furnaces used in ISP 4.5 Explain the working of blast furnace with a diagram 4.6 Explain the working of oxygen furnace with a diagram 4.7 Explain the working of electric furnace with a diagram 4.8 Explain the measurement of level of molten metal . 4.9 Explain the measurement of temperature of furnace. **5.0 Pulp and Paper Plant Instrumentation (PPPI)** 5.1 Define the term pulp. 5.2 List the types of pulping processes (Mechanical and Chemical processes). 5.3 Draw the block diagram of mechanical pulping process and explain. 5.4 Draw the block diagram of chemical pulping process and explain. 5.5 Define the term paper. 5.6 Draw the general layout of paper making process. 5.7 Explain the basic process of making the paper based on the layout. 5.8 List the raw materials for making paper. 5.9 List the various types of paper products. 5.10 List the physical properties of paper. 5.11 List types of control system units used in pulp and paper industry. 5.12 Explain the controlling of paper thickness with a diagram. 5.13 Explain the graphic displays and alarms in PPP.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-505.1	1	1						3	2	
AEI-505.2	2	2						3	2	
AEI-505.3	2	2						3	2	
AEI-505.4	2	2						3	2	
AEI-505.5	2	2						3	2	
Average	**1.8**	**1.8**						**3**	**2**	

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENT:

1.0 **Methods of power generation in Power Plant: -** Thermal power plant layout-Hydroelectric power plant- Wind power plant-Solar power plant-Nuclear powerplant.

2.0 Instrumentation and Control in Power Plant: Block diagram of boiler process inthermal power plant- combustion system of a boiler- measurement of flow offeed water - single element drum level control of boiler- steam temperature and pressure control- series fuel – air ratio control- furnace draft control measurementof turbine shaft speed- eccentricity measurement of turbine.

3.0 Petro-chemical Plant Instrumentation: Plant layout- Crude oil-Distillationcolumn, Batch and continuous distillations.

4.0 Iron and Steel Plant Instrumentation:-Manufacturing process of Iron andsteel- Furnace types- blast, oxygen and electric furnaces- Measurement ofmolten metal level and temperature of furnace.

5.0 Pulp and Paper Plant Instrumentation: - Mechanical and Chemical pulpingprocesses -Paper production-Physical properties of paper-Types of paperproducts- controlling of paper thickness - Control system units

Reference Books:

1. A course in power plant engineering – Arora and Domkundwar
2. Power plant Instrumentation – K.Krishnaswamy and ponnibala
3. Principles of Indusrial Instrumentation – D. Patranabis,TMGH.
4. Instrumentation in Process Industries -- Bela G.Liptak
5. Hand book of applied Instrumentation -- D.M. Consodine
6. Chemical Process Industries -- Austine G.T. Shreeves
7. Power Plant performance -- Gill A.B.
8. Power Station Instrumentation -- Jervis M.J.

BLUE PRINT

S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Methods of power generation in Power Plant	10	11	3	8			1	1			CO1
2	Instrumentation and control in power Plant	16	14	6	8			2	1			CO2
3	Petro Chemical Plant Instrumentation	11	17	9	8			3	1			CO3
4	Iron and Steel Plant Instrumentation	12	11	3	8			1	1			CO4
5	Pulp and Paper Plant Instrumentation	11	17	9	8			3	1			CO5
	Higher order question from ANY OF THE Chapters From 1 TO 5		10			10				1		CO1 to CO5
	Total	**60**	**80**	**30**	**40**	**10**	**-**	**10**	**5**	**1**	**-**	**-**

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 3.4
Unit Test-II	From 3.5 to 5.13

BOARD DIPLOMA EXAMINATION, (C-20)
DAEIE- FIFTH SEMESTER EXAMINATION
Instrumentation in Process Industries

Time: 3 Hours Total Marks: 80M

PART- A3×10=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 principle of power generation in hydroelectric power plant. (CO1)
2. Draw the diagram of single element drum level control of boiler. (CO2)
3. Write any three important variables that need to be measured in thermal power plant. (CO2)
4. List any three physical parameters to be measured in distillation column. (CO3)
5. Define the term distillation column. (CO3)
6. List the basic steps in refinery process. (CO3)
7. Write any three types of furnaces used in ISP. (CO4)
8. List any three physical properties of paper. (CO5)
9. List any three types of paper products. (CO5)
10. Define the term Pulp. (CO5)

PART- B5×8=40

Instructions: (1) Answer either (A) or (B) from each question, each question carries Eight marks.

(2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A). Explain the general layout of thermal power plant with diagram. (CO1)

Or

(B). Explain the general layout of wind power plant with diagram. (CO1)

12. (A). Explain the block diagram of boiler process in thermal power plant with diagram. (CO2)

Or

(B). Explain furnace draft control with diagram. (CO2)

13. (A). Explain the working of batch distillation column with diagram (CO3)

or

(B). Explain the general layout of a Petro chemical plant with diagram. (CO3)

14. (A). Explain the measurement of molten metal level with diagram. (CO4)

Or

(B). Explain the working of blast furnace with diagram. (CO4)

15. (A). Explain chemical pulping process with block diagram. (CO5)

Or

(B). Explain the controlling of paper thickness with a diagram. (CO5)

PART- C

1×10=10

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

16.Draw and explain the general layout of paper making process. (CO5)

***

DAEIE- FIRST UNIT TEST
MODEL QUESTION PAPER(C-20)

Instrumentation in Process Industries (AEI-505)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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. i) The emergency shutdown of a power generation turbine due to unexpected events is called-------- (CO2)4X1M=4M ii) In steam boiler, ---------- can be known as attemperator as it can reduce and control temperature of superheated steam. (CO2)
   iii) Solar power plant converts solar energy into electrical energy.(True/False) (CO1)
   iv) A ---------is used in nuclear reactor to slow down the speed of neutrons in nuclear fission. (CO1)
2. State the importance of measurement and instrumentation in power plant. (CO1)3M
3. Define petroleum Refinery. (CO3) 3M
4. List the basic steps in refinery process. (CO3)3M
5. Write the principle of power generation in thermal power plant. (CO2)3M

PART- B3×8M=24M

Instructions: Answer either (A) or (B) from each question andeach question carries Eight marks.

6. (A). Explain the process of power generation in Hydroelectric power plant with diagram (CO1)

   Or

   (B). Draw the block diagram of boiler process in thermal power plant and explain each block. (CO2)

7. (A). Explain single element drum level control of boiler with a diagram. (CO2)

   Or

   (B). Explain the general layout of petro chemical plant. (CO3)

8. (A). Explain furnace draft control. (CO2)

   or

   (B). Explain the process of power generation in Wind power plant with diagram (CO1)

***

COMMUNICATION ENGINEERING

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-506	Communication Engineering	4	60	20	80

S.NO	Major Topics	No. of Periods	COs Mapped
1	Analog communication	16	CO1
2	AM and FM detectors, Receivers	13	CO2
3	Pulse modulation	16	CO3,C04
4	Modern communication systems	15	CO5
	TOTAL	**60**	

Upon completion of the course the student shall be able to			
Course Objectives		(i) ii)	UseAnalog communication, AM&FM detectors and receivers. Acquaint with pulse modulation techniques Acquaint with modern communication
Course outcomes	CO1	AEI-506.1	Explain analog modulation techniques i.e AM & FM.
	CO2	AEI-506.2	Explain the principles of AM and FM detectors and Receivers.
	CO3	AEI-506.3	Explain the Principles of pulse modulation.
	CO4	AEI-506.4	Explain the different digital modulation techniques ASK, FSK & PSK.
	CO5	AEI-506.5	Explain the principles of modern communication systems.
Learning Outcomes		**1.0 Analog communication** 1.1 Draw block diagram of basic communication system and explain each block. 1.2 Define modulation and state the need for Modulation in communication system. 1.3 Name the different types of Analog modulation methods. 1.4 Explain AM, FM and PM with waveforms and give their expressions. 1.5 Explain SSB, DSBSC and VSB. 1.6 List the merits and demerits of AM and FM. 1.7 Distinguish between FM and PM. 1.8 Explain AM generation using base circuits and collector circuits. 1.9 Draw the block diagram and explain AM transmitter. 1.10 Explain the methods of FM generation by using Reactance tube and Varactor diode. 1.11 Draw the block diagram and explain FM transmitter. **2.0 AM and FM detectors and Receivers.**	

		2.1 Explain the principle of TRF receiver. 2.2 State the need for heterodyning in radio receiver. 2.3 Draw and explain the block diagram of super heterodyne receiver. 2.4 Define the terms selectivity, sensitivity, fidelity and Image Frequency Rejection. 2.5 Explain the basic principle of operation of AM detector. 2.6 Draw and explain single diode detector circuit. 2.7 List FM demodulator circuits. 2.8 Draw and explain Fosters – Seely demodulator. 2.9 Draw and explain FM receiver. **3.0 Pulse modulation** 3.1 State the principle of pulse modulation. 3.2 List different types of pulse modulation methods. 3.3 Sketch the waveforms of PAM, PPM, PWM 3.4 Explain PCM with Block Diagram. 3.5 List the merits of PCM. 3.6 List the applications of the above four types of modulation. 3.7. List the digital modulation methods. 3.8 Draw the waveforms of ASK, FSK and PSK. 3.9 List the applications of ASK, FSK and PSK. 3.10 List different types of multiplexing methods and explain them with neat diagrams 4.0 **Modern Communication Systems** 4.1 State the basic principle of Radar with a block diagram. 4.2 Explain the principle of fibre optic communication with a block diagram. 4.3 List the Transmitters and receivers used in fibre optic communication. 4.4 Explain the principle of Satellite communication system. 4.5 Explain uplink and downlink and the frequencies used in satellite communication system. 4.6 Explain the principle of cellular communication. 4.7 Explain FDMA, TDMA and CDMA. 4.8 List the features of GSM Mobile Technology. 4.9 List the features of CDMA Technology. 4.10 Compare CDMA &GSM**.**

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-506.1	*1*	*1*	*1*		*1*			*2*	*1*	
AEI-506.2	*1*	*1*	*1*		*1*			*2*	*1*	
AEI-506.3	*1*	*1*	*1*		*1*			*2*	*1*	
AEI-506.4	*1*	*1*	*1*		*1*			*2*	*1*	
AEI-506.5	*1*	*1*	*1*		*1*			*2*	*1*	
Average	***1***	***1***	***1***		***1***			***2***	***1***	

3= Strongly mapped
2= Moderately mapped
1= Slightly mapped

COURSE CONTENTS

1.0 **Analog Communication**

Modulation, AM, FM, PM, SSB, DSB and VSB, Generation of AM and FM, AM Transmitter, FM Transmitter.

2.0 AM and FM Detectors / Receivers

TRF Receiver, Super heterodyne Receiver, Selectivity, Sensitivity and Fidelity, FM Receiver, Diode detector, Foster-Seely Demodulator.

3.0 Pulse Modulation

Principle of pulse modulation, PAM, PWM, PPM, PCM and Applications, ASK, FSK and PSK.Multiplexing methods.

4.0 Modern communication systems

Radar, Fibre optic communication, Satellite communication, GSM Mobile Technology, CDMA, and GSM.

REFERENCE BOOKS

1. Mobile Cellular Telecommunications - by William C.Y. Lee
2. Satellite Communication - by Martin
3. Communication systems - by Simon Hawkins
4. Electronic Communication Systems - by Kennedy
5. Wireless communication Systems - by William shallings
7. Principles of communication engineering –by Anokhsiagh and A K Chhapra
8. Principles of communication engineering –by Kennedy

BLUE PRINT

S. No	Major Topics	No. of periods	Weightage of marks	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				COs Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Analog communication	16	17	9		8		3		1		CO1
2	AM and FM detectors, receivers	13	14	6	8			2	1			CO2
3	Pulse modulation	16	14	6	8			2	1			CO3,C04
4	Modern communication systems	15	25	9	16			3	2			CO5
	Higher order question from chapters 1 to 4		10			10				1		CO1 to CO5
	Total	**60**	**80**	**30**	**32**	**18**	**-**	**10**	**4**	**2**	**-**	**-**

Table specifying syllabus to be covered for UNIT tests.

Unit Test	Learning Outcomes to be covered
Unit Test-I	From 1.1 to 2.9
Unit Test-II	From 3.1 to 4.10

C-20-AEI-506

BOARD DIPLOMA EXAMINATION, (C-20)

DAEIE- FIFTH SEMESTER EXAMINATION

COMMUNICATION ENGINEERING

Time: 3 Hours Total Marks: 80M

PART- A3×10=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. Draw block diagram of basic communication system. (CO1)
2. Name any three types of Analog modulation methods. (CO1)
3. Distinguish between FM and PM in any three aspects. (CO2)
4. State the need for heterodyning in radio receiver. (CO2)
5. List FM demodulator circuits. (CO2)
6. State the principle of pulse modulation. (CO3)
7. List three merits of PCM. (CO4)
8. Sketch the waveforms of PAM (CO4)
9. Compare CDMA &GSM**.** (CO5)
10. State the basic principle of Radar. (CO5)

PART- B

5×8=40

Instructions: (1) Answer either (A) or (B) from each question, each question carries Eight marks.
(2) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (A). Explain AM generation using collector circuits. (CO1)

or

(B). Explain AM with waveforms and give their expressions. (CO1)

12. (A). Explain the basic principle of operation of AM detector. (CO2)

or

(B). Explain the principle of TRF receiver. (CO2)

13. (A). Explain PCM with Block Diagram. (CO3)

Or

(B). List different types of multiplexing methods and explain any one of them with neat diagram. (CO4)

14. (A). Explain the principle of fibre optic communication with a block diagram. (CO5)

Or

(B). (a)Explain uplink and downlink and the frequencies used in satellite communication system. (CO5) 4M

(b) List the features of GSM Mobile Technology. (CO5) 4M

15. (A). Explain the principle of cellular communication. (CO5)

Or

(B). Explain FDMA technique. (CO5)

PART- C

1×10=10

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

16. Draw and explain single diode detector circuit (CO2)

***

DAEIE- FIRST UNIT TEST

MODEL QUESTION PAPER(C-20)

COMMUNICATION ENGINEERING (AEI-506)

Time: 90 Mins. Total Marks: 40M

PART- A **Total: 16M**

Instructions: (1) Answer all questions
(2) First question carries four marks and each of rest carries three 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. i) Define modulation. (CO1) 4X1M=4M
   ii)For AM receivers the standard IF frequency is ------- (CO2)
   iii) Fidelity means____. (CO2)
   iv) In a FM receiver, amplitude limiter eliminates any change in amplitude of received FM signals.(T/F) (CO2)
2. Name three types of analog modulation methods (CO2) 3M
3. List the merits and demerits of AM (CO2) 3M
4. Define the term selectivity. (CO2) 3M
5. List FM demodulator circuits. (CO2) 3M

PART- B

3×8M=24M

Instructions: Answer either (A) or (B) from each question andeach question carries Eight marks

6. (A). Explain the methods of FM generation by using varactor diode. (CO1)

   or

   (B). Draw block diagram of basic communication system and explain each block. (CO1)

7. (A). Explain AM generation using base circuits. (CO1)

   Or

   (B). Draw and explain the block diagram of super heterodyne receiver. (CO2)

8. (A). Draw and explain single diode detector circuit. (CO2)

   or

(B). Draw and explain FM receiver. (CO2)

***

BIO MEDICAL INSTRUMENTATION LAB

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-507	BIO MEDICAL INSTRUMENTATION LAB	3	45	40	60

S.NO	Major Topics	No. of Periods	COs Mapped
1	Measurement of non-Electrical Parameters	06	CO1
2	Diagnostic Medical Instruments	18	CO2
3	Therapeutic Instruments	06	CO3
4	Modern Medical Imaging Systems	15	CO4
	TOTAL	**45**	

Upon completion of the course the student shall be able to			
Course Objectives		(i) (ii) (iii) (iv)	Measure the blood pressure using sphygmomanometer & Digital BP meter. Record the ECG, EEG, EMG waveforms. Use defibrillator. Demonstrate the X-ray Machine.
Course outcomes	CO1	AEI-507.1	Use of sphygmomanometer and digital BP meter to measure blood pressure.
	CO2	AEI-507.2	Use of ECG, EEG, EMGto record the waveforms.
	CO3	AEI-507.3	Working of defibrillator.
	CO4	AEI-507.4	Know the working of X-ray Machine and CT scanner.

Learning Outcomes		**I. Measurement of non-electrical parameters:** 1). Measure the blood pressure i.e systolic and diastolic blood pressure using sphygmomanometer. 2). Measure the blood pressure using automated digital blood pressure monitor. **II. Diagnostic Medical Instruments:** 3). Obtain PQRSTU waveform from ECG. 4). Record the EEG waveform. 5). Record the EMG waveform. **III. Therapeutic Instruments:** 6). Study the use of defibrillator. **IV. Modern Medical Imaging Systems** 7). Study and demonstration of X-ray machine. 8). Study the use of CT scanner.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-507.1	1	1	1	2	2			2	2	1
AEI-507.2	2	2	2	2	2			2	2	1
AEI-507.3	1	1	1	2	2			2	2	1
AEI-507.4	2	2	2	2	2			2	2	1
Average	1.5	1.5	1.5	2	2			2	2	1

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

LIFE SKILLS

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
AEI-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 Explainthe 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 **AEI-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
PO6	CO1, CO2, CO3, CO4	27	45%		16 -59%: Level 2
PO7	CO1, CO2, CO3, CO4	7	30%		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					✓	✓	✓
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 Explainthe 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 Explainthe 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 Explainthe 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 Explainthe 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 Explainthe 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 State 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 State 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 State 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 Explainwhat causes stress and how to cope with stress at workplace.

    11.2 Demonstrate how stress can be overcome in a healthy way.

PLC & SCADA LAB

Course code	Course title	No of periods per week	Total no. of periods	Marks for FA	Marks for SA
AEI-509	PLC & SCADA LAB	3	45	40	60

S.NO	Major Topics	No. of Periods	COs Mapped
1	Familiarization of PLC trainer	03	CO1
2	PLC Programming	18	CO2
3	Interfacing with PLC	12	CO3
4	SCADA	12	CO4
	TOTAL	**45**	

Upon completion of the course the student shall be able to			
Course Objectives		(I) (ii) (iii) (iv)	Use PLC Trainer. Use the Ladder diagram programming. Explain the interfacing with PLC. Explain the use of SCADA Software.
Course outcomes	CO1	AEI-509.1	Use PLC Trainer.
	CO2	AEI-509.2	Application of Ladder programming.
	CO3	AEI-509.3	Implementation of interfacing pheripherals with PLC.
	CO4	AEI-509.4	Use of SCADA Software for creation of graphic symbols.
Learning Outcomes		I**. Familiarization with PLC.** 01. Familiarization with PLC trainer. II. **PLC programming**. 02. Implement the basic logic gates (AND, OR, NOT) using ladder programming 03. Implement the Universal gates (NAND, NOR) using Ladder programming L 04. Implement the EX-OR and Ex-NOR gates using PLC. 05. Write the program on ON-Delay Timer and OFF-delay Timer using Ladder programming. 06. Write the program on Retentive and non-retentive Timer using Ladder dia programming. 07. Write the program on Up counter and Down Counter using Ladder diagran programming.	

		III. **Interfacing with PLC.** 08. Implement the Traffic light controller using PLC with Ladder diagram programming. 09. Implement the Sequential control of induction motor using PLC with Ladder diagram programming. 10. Implement the Conveyer controller using PLC with Ladder programming. 11. Implement the Level controller using PLC with Ladder programming. IV. **SCADA** 12. Implement the Sequential control of induction motor using SCADA software 13. Implement the Conveyer controller using SCADA software.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-509.1	1	1			2			3	2	1
AEI-509.2	2	2			2			3	2	1
AEI-509.3	2	2			2			3	2	1
AEI-509.4	2	2			2			3	2	1
Average	1.75	1.75			2			3	2	1

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

FIELD PRACTICES

Course Code	Course title	No of periods/week	Total no of periods	Marks for FA	Marks for SA
AEI-510	FIELD PRACTICES	03	45	40	60

S No	Chapter/ Unit Title	No. of Periods	COs Mapped
I	Calibration	09	CO1
II	Preparation of PCB	06	CO2
III	Design of a Industrial Process using P&ID	03	CO3
IV	PC hardware and software	15	CO4
V	UPS, Biometric access system and CCTV	12	CO5
	Total	45	

Upon completion of the course the student shall be able to:

Course Objectives	1. Calibration of temperature transmitter and bourdon tube and troubleshooting of CRO.		
	2. Know the Preparation of PCB		
	3. Design of a industrial process using P&ID		
	4. Know the PC hardware and install the system and application software's.		
	5. Know the UPS, Biometric access system and CCTV		
Course Out comes	CO1	AEI-510.1	Calibration of temperature transmitter and bourdon tube.
	CO2	AEI-510.2	Know the Preparation of PCB
	CO3	AEI-510.3	Design of a industrial process using P&ID
	CO4	AEI-510.4	Know the PC hardware and install the system and application software's
	CO5	AEI-510.5	Know the UPS, Biometric access system and CCTV

LEARNING OUTCOMES:

I. Calibration and troubleshooting.

1. Calibration of temperature transmitter using decade resistance box.
2. Calibration of bourdon tube using dead weight tester.
3. Troubleshooting of CRO.

II. Preparation of PCB

4. Preparation of PCB using copper clad for a particular circuit (Use ORCAD).

III. Design of a Industrial Process using P&ID

5. Design and draw a circuit for an industrial process using P&ID.

IV. PC hardware and software

6. Assembling and dissembling of a PC.
7. Installing system and application software.
8. Install and configure of different printers.
9. Practice on partition and formatting of hard disk.
10. Implementation of Wi-Fi network.

V. UPS, Biometric access system and CCTV

11. Know the sequence of operations of switching ON/OFF of UPS and note down the ratings of UPS.
12. Installation, testing and maintenance of biometric access system.
13. Identify the components and tools required to identify the CCTVs.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
AEI-510.1	1				3			3	2	
AEI-510.2	1				3			3	2	
AEI-510.3	1				3			3	2	
AEI-510.4		2						3	2	
AEI-510.5					3			3	2	
Average	***1***	***2***			***3***			***3***	***2***	

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

PROJECT WORK

Sub. Name	Sub. Code	No.periods /Week	No.Periods /Semester
PROJECT WORK	**AEI-511**	**03**	**45**

In the project work the students should prepare a project report based on the observations of a nearby industry/ industries . They should also prepare a product and arrive at the costs for settling up an enterprise as per the norms required by the financial/industrial promotion agencies utilising techno entrepreneurship programmes in the manufacture or service industries .if the above suggested project is not possible ,they may choose a project .which is practical utility involving theoretical and practical skills and to execute the same.

VI SEMESTER

INDUSTRIAL TRAINING

Course Title : Industrial Training
Course Code : AEI-601
Duration : 6 months

Time schedule

S.NO	Code	TOPICS	Duration
1	AEI-601	• Practical training in Industry • Training Report Preparation Report Preparation: Title Page, Certificate, Acknowledgements, Abstract, Contents(introduction of Industry, Plant Layout, Organization Chart, List of Major Equipments, List of Processes: Skills Acquired; Conclusions; References	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 manufacturing processes, assembling, servicing, supervising in the engineering fields. 4. Install the good qualities of integrity, responsibility and self confidence.
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	Write report in technical projects

PO-CO Mapping

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

3: High, 2: Moderate,1: Low

Learning Outcomes

The student shall be able to display the following skill sets

1) Technical Skills *(Procedure for installation of sensors and transducers , calibration procedures* /Servicing of instruments / maintenance of instruments/ process control procedure of process variables like temperature, flow , pressure , level etc / use and applications of different softwares of PLC and SCADA/ microcontroller applications)
2) Draw of P& I diagrams of different process / instruments.
3) Analyzing different specifications of all instruments used in process/ industry.
4) Recognize and practice of safety measures.
5) Handling of Tools/Instruments/controllers/control valves.
6) Troubleshooting.

Scheme of evaluation

SI. No.	*Course*	*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 SET*	*Max Marks Allotted For each parameter*
1	*Technical skills*	*30*
2	*Draw P & I diagrams*	*15*
3	*Analyzing different specifications*	*15*
4	*Recognize and practice of safety measures*	*10*
5	*Handling of tools*	*20*
6	*Troubleshooting*	*30*
	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 (50/75)*120=66.67.

GUIDELINES FOR INDUSTRIAL TRAINING

1. Duration of the training: 6 months.
2. Eligibility: The As per SBTET norms
3. Training Area: Students may be trained in the fields Fabrication/Foundry/Manufacturing/Service/Drafting/Maintenance etc.
4. The candidate shall put a minimum of 90% attendance during Industrial Training.
5. If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.
6. Formative assessment at industry level shall be carried out by the Mentor from of the industry, where the student is undergoing training and the faculty in charge (Guide) from the concerned section in the institution.
7. 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.
8. 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.
9. Final Summative assessment at institution level is done by a committee including Head of the section(**of concerned discipline ONLY**),, External examiner and Faculty members who assessed the students during Industrial Training as members.

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 1st and 2nd 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.**

DEPARTMENT OF TECHNICAL EDUCATION
NAME OF THE INSTITUTION
INDUSTRIAL TRAINING ASSESSMENT

PIN:

NAME OF THE STUDENT:

Skill Set Sl.No	***SKILL SET***	***Max Marks Allotted For each parameter***	***Percentage of Marks to be awarded***			
			100%	***80%***	***50%***	***20%***
			Precisely completed the work	***Completed with reasonable perfection***	***Completed the work but lack of perfection.***	***Attempted work but not completed***
1	*Technical skills* *i) installation and calibration* *ii) servicing and maintanence* *iii) Use of softwares*	 *10* *10* *10*				
2	*Drawing of P&I diagrams*	*15*				
3	*Analysing of specifications*	*15*				
4	*Safety measures*	*10*				
5	*Handiling of Instruments*	*20*				
6	*Troubleshooting*	*30*				

(Marks in words:)

Signature of the Training In-charge (Mentor) (Guide)

Name:

Designation:

Signature of the visiting staff

Name:

Designation: