C24_CURRICULUM

DIPLOMA IN

MECHANICAL ENGINEERING

Offered By

STATE BOARD OF

TECHNICAL EDUCATION AND TRAINING TELANGANA HYDERABAD

TEACHING AND EXAMINATION SCHEME
III SEMESTER

S. No	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instructional Periods per week			Total Periods per semester	Credits	Continuous Internal Evaluation			Semester End Examination			
			L	T	P			Mid Sem 1	Mid Sem 2	Internal evaluation	Max Marks	Min Marks	Total marks	Min marks for Passing including internal
1	SC-301	Applied Engineering Mathematics	4	1	0	75	2.5	20	20	20	40	14	100	35
2	ME-302	Strength of Materials	4	1	0	75	2.5	20	20	20	40	14	100	35
3	ME-303	Thermodynamics	4	1	0	75	2.5	20	20	20	40	14	100	35
4	ME-304	Fluid Mechanics and Hydraulic Machinery	4	1	0	75	2.5	20	20	20	40	14	100	35
5	ME-305	Engineering Materials	4	1	0	75	2.5	20	20	20	40	14	100	35
6	ME-306	Additive and Advanced Manufacturing Process	4	1	0	75	2.5	20	20	20	40	14	100	35
7	ME-307	Machine Drawing	1	0	2	45	1.25	20	20	20	40	20	100	50
8	ME-308	Material Testing and Hydraulic Machines Lab	1	0	2	45	1.25	20	20	20	40	20	100	50
9	ME-309	Advanced Manufacturing Lab	1	0	2	45	1.25	20	20	20	40	20	100	50
10	HU-310	Communication Skills & Life Skills Lab	1	0	2	45	1.25	20	20	20	40	20	100	50
TOTAL			**28**	**6**	**8**	**630**	**20**	**200**	**200**	**200**	**400**	**164**	**1000**	**410**

Pass criteria: The minimum marks required for passing in any of courses are given below

1. Cumulative 35% (Mid Sem 1 + Mid Sem 2+ Tutorials+ End examination) and minimum marks in end examination is 35% (i.e.14marks).
2. If the cumulative of CIE is less than 35% (i.e.21 marks out of 60) therefore more than 35% of SEE is required to get overall 35%.

SC-301-APPLIED ENGINEERING MATHEMATICS

Course Title	Applied Engineering Mathematics	Course Code	SC-301
Semester	III	Course Group	Foundation
Teaching Scheme in Periods (L : T : P)	4:1:0	Credits	2.5
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites:

This course requires the knowledge of Basic Engineering Mathematics and Engineering Mathematics at Diploma 1st and 2nd Semester level.

Course Outcomes (COs):

At the end of the course, the student will have the ability to:

CO 1	Evaluate the Indefinite Integrals of various functions. by Using substitution method
CO 2	Integrate various continuous functions using different methods of integration
CO 3	Integrate various functions by using Partial fractions and Integration by parts method.
CO 4	Evaluate the Definite Integrals using Fundamental Theorem of Integral Calculus and its properties.
CO 5	Compute the Areas of irregular shapes and Volumes of solids of revolution using the concept of Definite Integrals.
CO 6	Find the Mean and RMS values of various functions in engineering problems and evaluate Numerical problems in engineering by using Trapezoidal and Simpson's 1/3rd rule.

Course Content:

Unit-I Indefinite Integration – I: **Duration: 13Periods (L: 10– T:3)**

Integration as an inverse process of Differentiation- Indefinite integral of standard functions- Properties of Indefinite Integral- Integration by Substitution - Integrals using Trigonometric identities of the form: $\int \sin^2 x\, dx, \int \cos^2 x\, dx, \int \sin^3 x\, dx, \int \cos^3 x\, dx, \int \sin Ax \cos Bx\, dx, \int \cos Ax \cos Bx\, dx$ and $\int \sin Ax \sin Bx\, dx$, where A and B are constants- Integrals of tan x, cot x, sec x and cosec x-Integrals of the form $\int \sin^m x . \cos^n dx$ and $\int \tan^m x . \sec^n dx$, where m and n are positive integers.

Unit – II Indefinite Integration – II: **Duration: 12Periods (L: 10– T:2)**

Integrals of some particular functions (Nine standard integrals) of the type:$\int \frac{1}{a^2+x^2}dx$, $\int \frac{1}{a^2-x^2}dx$, $\int \frac{1}{x^2-a^2}dx$, $\int \frac{1}{\sqrt{a^2+x^2}}dx$, $\int \frac{1}{\sqrt{a^2-x^2}}dx$, $\int \frac{1}{\sqrt{x^2-a^2}}dx$, $\int \sqrt{a^2+x^2}\,dx$, $\int \sqrt{a^2-x^2}\,dx$and$\int \sqrt{x^2-a^2}\,dx$ - Integrals of the type: $\int \frac{1}{ax^2+bx+c}dx$,$\int \frac{1}{\sqrt{ax^2+bx+c}}dx$,$\int \sqrt{ax^2+bx+c}\,dx$, $\int \frac{px+q}{ax^2+bx+c}dx$, $\int \frac{px+q}{\sqrt{ax^2+bx+c}}dx$,$\int (px+q\sqrt{ax2+bx+c}+$, $\int \frac{1}{a\pm bsinx}dx$,$\int \frac{1}{a\pm bcosx}dxand\int \frac{1}{asinx\pm bcosx\pm c}dx$,where *a, b, c, p* and *q* are constants.

Unit-III Indefinite Integration–III: **Duration: 12 Periods (L: 10 – T:2)**

Integration by using Partial fractions-Integration by parts - Bernoulli's rule for integration by parts - Integrals of the type: $\int e^{ax}\sin bx\,dx$, $\int e^{ax}\cos bx\,dx$ and$\int e^x[f(x)+f'(x)]dx$,where a and b are constants.

Unit – IV Definite Integral and its Properties: **Duration:13Periods(L: 10 – T:3)**

Definite integral - Fundamental Theorem of Integral Calculus –Evaluation of definite integrals by Substitution Method- Properties of Definite Integrals -Evaluation of Definite integrals by applying their properties.

Unit – V Applications of Definite Integrals: **Duration: 13Periods (L: 10 – T:3)**

Areas under simple curves -Sign of the Area -The area of the region bounded by a curve and a line - Area between two curves -Volumes of solids of revolution about axes - Volumes of solids of revolution of the area of the region bounded by the curve and a line about axes - Volumes of solids formed by rotating a region bounded by the curves about axes.

Unit – VI Mean, RMS values and Numerical Integration: Duration: 12Periods (L: 10 – T:2)

Mean Values and Root Mean Square (R.M.S) values of a function in a given interval-Numerical Integration: Trapezoidal rule and Simpson's $\frac{1}{3}$-rule to evaluate an approximate value of a definite integral in a given interval- Problems leading to engineering applications.

Reference Books:

1. Higher Engineering Mathematics, by B.S.Grewal - Khanna publishers.
2. Thomas' Calculus, Pearson Publishers.
3. NCERT Mathematics Text Book for class XII, Part II.
4. Integral Calculus by Shanti Narayan and P. K. Mittal, S. Chand Publishers.

Suggested E-Learning references:

1. https://www.khanacademy.org/
2. https://www.wolframalpha.com/
3. https://onlinecourses.nptel.ac.in/
4. http://tutorial.math.lamar.edu/

Suggested Learning Outcomes:

At the end of the course, the student will have the ability to:

1.0 Apply the properties of Indefinite Integral and Substitution Method to evaluate the Indefinite Integrals of various functions.

1.1 Explain the concept of Integration as an inverse process of Differentiation with standard notations.

1.2 Classify the Definite and Indefinite Integrals.

1.3. Formulate the standard Integrals using the definition of Integration.

1.4. State the properties of Definite Integrals.
(i.e., $\int (u \pm v)dx$, and $\int ku\ dx$,where *u, v* are functions in *x* and *k* is a scalar).

1.5 Use the Indefinite integrals of standard functions and properties of Integrals in solving engineering problems.

1.6 Evaluate Integrals involving simple functions of the following types by the method of Substitution:

i) $\int f(ax+b)dx$,where *f*(*x*)is in standard form,

ii) $\int f\big(g(x)\big)g'(x)dx$,

iii) $\int f(x^n)x^{n-1}dx$,

iv) $\int [f(x)]^n f'(x)dx$,

v) $\int \frac{f'(x)}{\sqrt{f(x)}}dx$

vi) $\int \frac{f'(x)}{f(x)}dx$

1.7 Find the integrals of tan *x*, cot *x*, sec *x* and cosec *x*.

1.8 Use some trigonometric identities to find the integrals of the type: $\int \sin^2 x\ dx$, $\int \cos^2 x\ dx$, $\int \sin^3 x\ dx$, $\int \cos^3 x\ dx$, $\int \sin Ax \cos Bx\ dx$, $\int \cos Ax \cos Bx\ dx$ and $\int \sin Ax \sin Bx\ dx$, where *A* and *B* are constants.

1.9 Evaluate the integrals of the type: $\int \sin^m x.\cos^n dx$,where *m* and *n* are positive integers.

1.10 Evaluate the integrals of type: $\int \tan^m x.\sec^n dx$, where *m* and *n* are positive integers.

2.0 Use Indefinite Integration to solve engineering problems

2.1 Evaluate theintegrals of some particular functions (Nine standard integrals) of the type:

$\int \frac{1}{a^2+x^2}\,dx$, $\int \frac{1}{a^2-x^2}\,dx$, $\int \frac{1}{x^2-a^2}\,dx$, $\int \frac{1}{\sqrt{a^2+x^2}}\,dx$, $\int \frac{1}{\sqrt{a^2-x^2}}\,dx$, $\int \frac{1}{\sqrt{x^2-a^2}}\,dx$, $\int \sqrt{a^2+x^2}\,dx$, $\int \sqrt{a^2-x^2}\,dx$ and $\int \sqrt{x^2-a^2}\,dx$,where a is a constant.

2.2 Evaluate the integrals of the type:$\int \frac{1}{ax^2+bx+c}\,dx$,$\int \frac{1}{\sqrt{ax^2+bx+c}}\,dx$ and $\int \sqrt{ax^2+bx+c}\,dx$, where a, b and c are constants.

2.3 Evaluate the integrals of the type:$\int \frac{px+q}{ax^2+bx+c}\,dx$, $\int \frac{px+q}{\sqrt{ax^2+bx+c}}\,dx$ and $\int (px+q)\sqrt{ax^2+bx+c}\,dx$,Where a, b, c, p and q are constants.

2.4 Evaluate the integrals of the type:$\int \frac{1}{a\pm bsinx}\,dx$, $\int \frac{1}{a\pm bcosx}\,dx$ and $\int \frac{1}{asinx \pm bcosx \pm c}\,dx$, where a, b and c are constants.

3.0 Integrate various functions by using Partial fractions and Integration by parts.

3.1 Evaluate Indefinite Integrals using Partial fractions.

3.2 Evaluate Indefinite Integrals using Integration by parts.

3.3 Apply the Bernoulli's rule for evaluating the Integrals of the form $\int u.v\,dx$, where u and v are functions in x.

3.4 Evaluate the Integrals of the form $\int e^{ax} \sin bx\,dx$ and $\int e^{ax} \cos bx\,dx$,where a and b are constants.

3.5 Evaluate the Integrals of the form $\int e^x[f(x)+f'(x)]\,dx$.

4.0 Evaluate the Definite Integrals using Fundamental Theorem of Integral Calculus and its Properties.

4.1 State the Fundamental Theorem of Integral Calculus.

4.2 Calculate the Definite Integrals over an interval by using the Fundamental Theorem of Integral Calculus.

4.3 Evaluate the Definite Integrals by using Substitution Method.

4.4 Explain various properties of Definite Integration.

4.5 Evaluate the Definite Integrals by using its properties.

5.0 Compute the Areas of irregular shapes and Volumes of solids of revolution using the concept of Definite Integrals.

5.1 Define Area under simple curves.

5.2 Describe the sign of the Areas of simple curves.

5.3 Calculate the Areas under simple curves.

5.4 Determine the area of the region bounded by a curve and a line.

5.5 Find the area enclosed between two curves using methods of Definite Integration.

5.6 Define the volume of a solid generated by revolving a region bounded by the curves about axes.

5.7 Explain Volumes of solids of revolution.

5.8 Calculate the Volumes of a solid that is obtained by revolving a plane region about axes.

5.9 Compute the Volumes of solids of revolution of the area of the region bounded by the curve and

5.10 Evaluate the Volumes of solids formed by rotating a region bounded by the curves about axes. a line about axes.

6.0 Understand Mean, RMS values and Numerical Methods

6.1 Explain Mean Value, Mean Square Value and Root Mean Square (RMS) value of the functions in any given interval.

6.2 Obtain the Mean Value, Mean Square Value and Root Mean Square (RMS) values of the functions in any given interval.

6.3 Explain Trapezoidal rule and Simpson's $\frac{1}{3}$rules.

6.4 Apply the Trapezoidal rule, Simpson's $\frac{1}{3}$ rules for for approximation of definite integrals

6.5 Solve the problems leading to engineering applications by using above methods.

Suggested Student Activities:

1. Student visits Library to refer Standard Books on Mathematics and collect related material.

2.Quiz.

3.Group discussion.

4.Surprise tests.

5. Seminars.

6. Home Assignments.

7. Mathematics for preparing competitive exams and solving old question papers on arithmetical ability.

CO / PO - MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	3	2					3	1, 2 ,7
CO2	3	2					3	1, 2 ,7
CO3	3	2					3	1, 2 ,7
CO4	3	2					3	1, 2 ,7
CO5	3	2	2				3	1, 2 ,3,7
CO6	3	2	2				3	1, 2, 3, 7

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA EXAMINATIONS (C - 24)
SC-301
SEMESTERIII,MID –I EXAM, MODEL PAPER
APPLIED ENGINEERING MATHEMATICS
(Open Book System)

Duration: 1: 00 Hour **Max. Marks: 20**

PART-A

Instructions: 1. Answer **ALL** questions. 04 × 01 = 04
2 Each question carries **ONE** mark.

1. Find: $\int \left(2x - \sqrt{x} + x^3\right) dx$.
2. Find: $\int \frac{dx}{3x+7}$.
3. Find: $\int \frac{dx}{\sqrt{25-x^2}}$.
4. Find: $\int \sqrt{7+x^2}$ dx.

PART-B

Instructions: 1. Answer **ALL** questions. 02 × 03 = 06
2. Each question carries **THREE** marks.

5(a) Evaluate: $\int sin^3 x\, dx$.

OR

5(b) Evaluate: $\int \frac{cos\sqrt{2x}}{\sqrt{2x}} dx$.

6(a)Evaluate: $\int \frac{3x^2}{4+x^6} dx$.

OR

6(b)Evaluate: $\int \sqrt{x^2+2x+5}\, dx$.

PART- C

Instructions: 1. Answer **ALL** questions. 02 × 05 = 10
2. Each question carries **FIVE** marks.

7(a) Evaluate: $\int \frac{dx}{4sin^2 x+9cos^2 x}$.

OR

7(b) Evaluate: $\int sin^7 x.cos^3 d$

8(a)Evaluate: $\int \frac{2x+5}{\sqrt{x^2-2x+2}} dx$.

OR

8(b)Evaluate: $\int \frac{1}{4sinx+3cosx+6} dx$.

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SEMESTERIII,MID –II EXAM, MODEL PAPER
APPLIED ENGINEERING MATHEMATICS
(Open Book System)

Duration: 1: 00 Hour **Max. Marks: 20**

PART-A

Instructions: 1. Answer **ALL** questions. 04 × 01 = 04
2 Each question carries **ONE** mark.

1. Find: $\int e^{2x} sin3x\, dx$.
2. Find: $\int e^{x}(\cot x + \log \sin x)\, dx$.
3. Find: $\int_0^1 (x^4 + 1)\, dx$
4. Find: $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x\, cos\, x^2\, dx$.

PART-B

Instructions: 1. Answer **ALL** questions. 02 × 03 = 06
2. Each question carries **THREE** marks.

5(a) Evaluate: $\int \sinh 2x\, .\, sin2x\, dx$.

OR

5(b) Evaluate: $\int x^3 sin2x\, dx$ by using Bernoulli's rule.

6(a) Evaluate: $\int_0^{\frac{\pi}{2}} \frac{sin^{2025} x}{sin^{2025} x + cos^{2025} x}\, dx$.

OR

6(b) Evaluate: $\int_0^{2\pi} cos^2\, 7x\, dx$.

PART C

Instructions: 1. Answer **ALL** questions. 02 × 05 = 10
2. Each question carries **FIVE** marks.

7(a) Evaluate: $\int \frac{x^2}{x^2+7x+10}\, dx$.

OR

7(b)Evaluate: $\int \frac{x cos^{-1} x}{\sqrt{1-x^2}}\, dx$.

8(a) Evaluate: $\int_0^{\pi} \frac{x}{25cos^2 x + 16sin^2 x}\, dx$.

OR

8(b) Evaluate: $\int_0^1 \frac{cos^{-1} x}{x}\, dx$.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
DIPLOMA EXAMINATIONS (C - 24)
SC-301
SEMESTER III, SEMESTER END EXAM, MODEL PAPER
APPLIED ENGINEERING MATHEMATICS
(Open Book System)

Duration: 2 hours **[Total Marks: 40]**

PART-A

Instructions: 1. Answer **ALL** questions. 08 ×01 = 08
2 Each question carries **ONE** mark.

1. Find $\int(a_0 + a_1x + a_2x^2 + \cdots + a_nx^n))dx$.

2. Find $\int_{-1}^{1} x^2 \sin x^3 \, dx$.

3. Find the area bounded by the curve y = x^2, the *x* – axis and the ordinates *x* = 1and *x* = 3.

4. Find $\int \frac{1}{x\cos^2(\log x)} dx$.

5. Find the mean value of sin *x* over (0, 2π).

6. Find the volume of the solid generated when the area bounded by the curve y = x^3, the *x* – axis and the lines *x* = 0 to *x* = 1.

7. Find the R.M.S value of $\sqrt{x}$over the range (2, 3).

8. Find the approximate value of $\int_0^6 f(x)\, dx$ from the following table:

x	0	2	4	6
f(*x*)	3	7	11	9

by Trapezoidal Rule.

PART-B

Instructions: 1. Answer **ALL** questions. 04 × 03 = 12
2. Each question carries **THREE** marks.

9(a) Evaluate: $\int \frac{1}{\sqrt{\sin^{-1}x}\sqrt{1-x^2}} dx$.

OR

9(b) Find the area bounded by the curve y = cos *x* in (0, π).

10(a) Evaluate: $\int_0^5 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{5-x}} dx$.

OR

10(b) A swimming pool is 100 feet wide and the depth *d* in meters at a distance *x* meters from bank is given by the following table:

x	0	20	40	60	80	100
d	0	7	9	15	8	2

Find the cross-section area of the swimming pool using Simson's $\frac{1}{3}$ -rule.

11(a) Find the area included between the parabola $x^2 = 16y$ and its latus rectum.

OR

11(b) Find the volume of the solid by rotating one arc of the curve $y = \sin 3x$ about x – axis.

12(a) Find the RMS value of $i = 3 \sin x$ over the half wave.

OR

12(b) Find the Mean value of $x^2 - 5x + 4$ between the values of *x*,where the expression vanishes.

PART C

Instructions: 1. Answer **ALL** questions $04 \times 05 = 20$

2. Each question carries **FIVE** marks

13(a) Evaluate: $\int \frac{5x+3}{\sqrt{x^2+4x+10}} dx$.

OR

13(b) Find the area enclosed between the curve $y^2 = 8x$ and the line $2y = x$.

14(a) Evaluate: $\int \frac{1}{x^4-1} dx$.

OR

14(b)The velocity of a train which starts from rest is given by the following table. The time is recorded in minutes from the start and speed in miles per hour.

Minutes	0	2	4	6	8	10	12	14	16	18	20
Miles/hour	0	10	18	25	29	32	20	11	5	2	0

Estimate approximately the total distance run in 20 meters using Simson's $\frac{1}{3}$ - rule.

15(a) Find the area between the two parabolas $y^2 = 4x$ and $x^2 = 12y$.

OR

15(b) Find the volume of the right circular cone of height h and semi vertical angle α.

16(a) Determine the Root Mean Square value of the function $y = x^2 e^{3x}$ in the range between $x = 0$ and $x = 2$.

OR

16(b)Find the Mean value of $sin^2 \omega t$ in the interval $\left[0, \frac{2\pi}{\omega}\right]$.

ME-302-STRENGTH OF MATERIALS

Course Title:	**Strength of Materials**	Course Code	**ME-302**
Semester	**III Semester**	Course Group	**Core**
Teaching Scheme in Periods (L:T:P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture+ Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites

Basic knowledge of Engineering Mechanics, Mathematics, Physics

Course Outcomes

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

CO1	Compute stress and strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section and of composite section under the influence of normal forces.
CO2	Compute the Strain Energy under various loading conditions
CO3	Compute shear force and bending moment at any section of beam and draw the S.F. & B.M diagrams for point loads and UDL.
CO4	Compute bending stresses, safe load, dimensions ,safe span of cross section and deflections of the given beam
CO5	Compute the diameter of shaft based on strength and rigidity and finding deflection and safe load in springs
CO6	Compute the stresses developed in thin cylinders

Course Content and Blue Print of Marks for SEE

Unit No	**Unit Name**	**Periods**	**Questions to be set for SEE**					
			R			**U**	**A**	
I	**Simple Stresses and Strains**		Q4	Q1		Q9(a)	Q13(a)	
II	**Strain Energy**							
III	**Shear Force and Bending Moment**			Q2		Q10(a)	Q14(a)	
IV	**Theory of Simple Bending & Deflection of Beams**							
V	**Torsion in Shafts and Springs**			Q3	Q5,Q6	Q9(b),Q11(a), Q11(b)	Q13(b),Q15(a), Q15(b)	
VI	**Thin Cylindrical Shells**				Q7,Q8	Q10(b),Q12(a), Q12(b)	Q14(b),Q16(a), Q16(b)	
	Total	**75**	**8**			**8**	**8**	

Course Contents

UNIT - 1: Simple stresses and Strains **Duration: 15 Periods (L: 12 – T: 3)**

Stress, Strain and their nature, Mechanical properties of common engineering materials, Stress – Strain diagram for M.S. and C.I. specimens and Significance of various points on it; Significance of factor of safety, Hooke's Law, Relation between elastic constants (without derivations); Longitudinal and lateral strain, Poisson's ratio; Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces, Related numerical problems on the above topics.

UNIT - 2: Strain Energy **Duration: 10 Periods(L: 8 – T: 2)**

Strain energy or resilience, proof resilience and modulus of resilience. Derivation of strain energy for the following cases. i) Gradually applied load, ii) Suddenly applied load,
iii) Impact/shock load. Related numerical problems

UNIT - 3: Shear Force and Bending Moment **Duration: 13 Periods (L: 10 – T: 3)**

Types of beams and loads; Definition and explanation of shear force and bending moment, Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases: Cantilever with point loads - Cantilever with uniformly distributed load - Simply supported beam with point loads - Simply supported beam with UDL - Over hanging beam with point loads, at the centre and at free ends - Over hanging beam with UDL throughout - Combination of point and UDL for the above (not more than two loads) - Related simple numerical problems; Point of contra flexure.

. **UNIT - 4: Theory of Simple Bending & Deflection of Beams**

Duration: 12 Periods (L: 10 – T: 2)

Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending; Bending Equation $M/I = \sigma/y = E/R$ (without derivation); Problems involving calculations of bending stress, modulus of section and moment of resistance; Calculation of safe loads and safe span and dimensions of cross- section;

Definition and explanation of deflection as applied to beams; Deflection formulae without proof for cantilever and simply supported beams with point load and UDL only (Standard cases only); Related numerical problems

UNIT - 5: Torsion in Shafts and Springs **Duration: 15 Periods (L: 12 – T: 3)**

Definition and function of shaft; Define the terms polar moment of inertia, torsional rigidity and torsional stiffness; Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion; Torsion Equation $T/J = \tau/r = G\theta/L$ (without derivation); Problems on design of shaft based on strength and rigidity; Numerical problems related to comparison of strength and weight of solid and hollow shafts

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Nomenclature of closed coil helical spring, Deflection formula for closed coil helical spring (without derivation). Explanation about stiffness of spring, Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.

UNIT - 6: Thin Cylindrical Shells **Duration: 10 Periods (L: 8 – T: 2)**

Explanation of longitudinal and hoop stresses in the case of circumferential and longitudinal failure of shell. Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells. Related numerical Problems for safe thickness and safe working pressure.

Text Books

1. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
2. Timoshenko and Young, Elements of Strength of Materials by East-West Press Ltd.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (P) Ltd. New Delhi.
6. Bansal R K, Strength of Materials, Laxmi Publications (P) Ltd. New Delhi.
7. Adarsh Swaroop, "Mechanics of Materials" 1st edition, New Age International Pvt. Ltd
8. Popov, Mechanics of Solids, 2/e, New Pearson Education,
9. S. B. Junnarkar and Dr. H. J. Shah ,Mechanics of Structures Vol.I& II , Twenty-second edition, Charotar Publishing House Pvt Ltd.
10. D. Ghosh A. K. Datta ,Strength of Materials by, New Age International Publishers
11. . F.L. Singer and Andrew Pytel ,Strength of Materials by, Harper and Row Publication.
12. Beer and Johnston ,Mechanics of Materials by, McGraw Hill Publication.

Suggested e-Learning Links

1. https://nptel.ac.in/courses/
2. https://www.slideshare.net/
3. https://en.wikipedia.org/wiki/Strength_of_materials
4. http://ndl.ethernet.edu.et/bitstream/
5. http://www.engineersedge.com/mechanics_material_menu.shtml/

Suggested Learning Outcomes

For achieving the Course outcomes, the following learning outcomes must be achieved

CO-1: Compute stress and strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section and of composite section under the influence of normal forces

1.1. Define the mechanical properties of commonly used engineering materials
1.2. Classify the forces on different criteria
1.3. Differentiate the rigid body from the deformable body
1.4. Define the term stress, strain and understand various types of stresses and strains
1.5. State Hooke's law and define various elastic constants
1.6. Draw Stress – Strain diagram for M.S and C.I. specimens and identify salient points on it
1.7. State the significance of factor of safety
1.8. Define the terms longitudinal & lateral strains and Poisson's ratio
1.9. Write down the relation between elastic constants E, N, K, & 1/m
1.10. Numerical problems related to the above cases
1.11. Compute stress and strain values in bodies of uniform sections
1.12. Compute stress and strain values in bodies of composite sections
1.13. Numerical problems related to the above cases
1.14. Define thermal stresses
1.15. Compute the thermal stresses in uniform and composite Bars
1.16. Numerical problems related to the above cases

CO-2: Compute the Strain Energy under various loading conditions

2.1 Understand the concept of strain energy
2.2 Define resilience,
2.3 Define proof - resilience
2.4 Define modulus of resilience.
2.5 Derive an expression for the strain energy.
2.6 Obtain expressions for instantaneous stress developed in bodies subjected to Gradually applied load
2.7 Obtain expressions for instantaneous stress developed in bodies subjected to Suddenly applied load
2.8 Obtain expressions for instantaneous stress developed in bodies subjected to Impact/ shock load
2.9 Compare of proof resilience in bodies subjected to the above loads.
2.10 Calculate the stresses and strains in the bars using the strain energy concepts.

CO-3: Compute shear force and bending moment at any section of beam and draw the S.F. & B.M diagrams for point loads and UDL

3.1 State the concept of beams
3.2 List the types of beams
3.3 List the types of loads
3.4 Define and shear force, bending moment and
3.5 Explain the terms shear force, bending moment and define point of contraflexure
3.6 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for cantilever with point loads
3.7 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for cantilever with UDL
3.8 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for cantilever with point loads & UDL
3.9 Calculate Support reactions for simply supported beam
3.10 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for simply supported beam with point loads
3.11 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for simply supported beam with UDL
3.12 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for simply supported beam with point loads & UDL
3.13 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for overhanging beam with point loads
3.14 Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for overhanging beam with UDL
3.15 Numerical problems related to the above cases.

CO-4: Calculate bending stresses, safe load, dimensions ,safe span of cross section and deflections of the given beam

4.1 Define the terms Neutral layer, Neutral Axis, Modulus of Section,
4.2 Define Moment of Resistance, Bending stress and Radius of curvature
4.3 Find out section modulus for various sections such as plain & hollow rectangular, square and circular sections,
4.4 List out the assumptions made in theory of simple bending
4.5 Write the Bending Equation $M/I = \sigma/y = E/R$ (without derivation) and understand the terms involved in it and their units
4.6 Calculate the bending stresses in beams of various cross-sections.
4.7 Solve the numerical problems involving calculations of bending stress, modulus of section and moment of resistance using bending equation
4.8 Solve the numerical problems involving calculations of safe loads and safe span and dimensions of cross- section using bending equation
4.9 Define and understand the concept of slope and deflection of beams
4.10 Write the deflection formulae without proof for cantilever beam with point load and UDL(Standard cases only)

4.11 Write the deflection formulae without proof for simply supported beam with point load and UDL (Standard cases only)
4.12 Solve numerical problems on deflection of cantilever beam subjected to point load
4.13 Solve numerical problems on deflection of cantilever beam subjected to UDL
4.14 Solve numerical problems on deflection of cantilever beam subjected to
4.15 Solve numerical problems on deflection of simply supported beams subjected to a combination of point load subjected to a combination of point load and UDL

CO-5: Compute the diameter of shaft based on strength and rigidity and finding deflection and safe load in springs

5.1 Define and state the functions of a shaft
5.2 Define the terms polar moment of inertia, torsional rigidity and torsional stiffness
5.3 Calculate of polar M.I. for solid and hollow shafts
5.4 List out the assumptions made in theory of simple torsion
5.5 Write the Torsion Equation $T/J = \tau/r = G\theta/L$ (without derivation) and understand the terms involved in it and their units
5.6 Solve numerical problems related to Torsion Equation
5.7 Design of solid and hollow shafts based on strength
5.8 Solve related numerical problems related to above case
5.9 Solve numerical problems related to comparison of strength and weight of solid and hollow shafts
5.10 State the function of spring
5.11 List the types of springs
5.12 List all the applications of springs
5.13 Define the terms related to closed coil helical spring
5.14 State the formulae for the stress and deflection of springs closed coil helical
5.15 Compute the stress and deflection of the closed coil helical spring

CO-6: Compute the stresses developed in thin cylinders

6.1 Define cylindrical shell
6.2 Define longitudinal stress
6.3 Define hoop stress
6.4 Derive the expression for longitudinal and hoop and seam shells and seamless shells
6.5 Changes in dimensions of thin cylinders due to an Internal pressure
6.6 Design thin cylindrical shells
6.7 Related numerical Problems for safe thickness
6.8 Related numerical Problems for working pressure

Suggested Student Activities

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 3-5 students.

- Each group should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned course coordinator and programme co-coordinator.
- Each group should conduct different activity and no repeating should occur.

1. Record various forces applied by human beings in their daily activities.
2. Identify the applications where parallelogram law of forces, Lami's theorem etc are used and prepare a report.
3. Using internet record various properties of commonly used materials and compare their strengths.
4. How a corrugated roof sheet differs from plain roof sheet? Demonstrate with models.
5. List out the applications of shafts in our daily activity as well as in industries.
6. Collect the pictures of various types of beams which practically exist.

CO-PO Mapping Matrix

	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	
CO1	3	2	2	1			2	1,2,3,4,7
CO2	3	2	3				1	1,2,3,7
CO3	3	2	3				2	1,2,3,7
CO4	3	3	3	1			2	1,2,3,4,7
CO5	3	2	3				2	1,2,3,7
CO6	3	3	3	1			2	1,2,3,4,7

State Board of Technical Education and Training, Telangana
Model Question paper
STRENGTH OF MATERIALS
Mid Semester-I Examination

Course Code: ME-302 **Duration:1 hour**
Course Name: Strength of Materials **Max.Marks: 20 Marks**

PART-A

Answer **all** questions- Each Question carries **ONE** mark **4x1 = 4 Marks**

1. List out any two types of stresses
2. Define lateral strain.
3. Write the formula for strain energy
4. Define proof resilience

PART-B

Answer **two** questions- Each Question carries **THREE** marks **2x3 = 6 Marks**

5. a) List out the three elastic constants and write down the relation between them
   (OR)
   b) Find the diameter of a M.S. rod, carrying a load of 560 KN. If the maximum tensile strength of the rod is 30 N/mm^2.
6. a) A steel bar if 30 mm diameter is stressed to 175 N/mm^2.What is the length of the bar if strain energy stored is 60 Nm.Assume E=2X105 N/mm^2
   (OR)
   b) Derive an expression for strain energy in a body subjected to impact loading

PART-C

Answer **two** questions- Each Question carries **FIVE** marks **2x5 = 10 Marks**

7. a) A tensile load of 15 KN is applied longitudinally on a mild steel bar having a diameter of 10 mm and 350 mm length. Calculate the extension in the bar, the change in diameter and change in volume. Take E = 2 X 10^5 N/mm^2 and the Poisson's ratio as 0.25.
   (OR)
   b) Draw stress-strain diagram for mild steel, show the salient points on it.

8. a) Prove that the stress induced is twice when the load applied is sudden?
   (OR)
   b) A load of 100N falls by gravity a vertical distance of 3000 mm when it is suddenly stopped by a collar at the end of a vertical rod of length 6m and diameter 20 mm .The top of the bar is rigidly fixed to a ceiling .Calculate the maximum stress and the strain induced in the bar

State Board of Technical Education and Training, Telangana
Model Question paper
STRENGTH OF MATERIALS
Mid Semester-II Examination

Course Code: ME-302 **Duration:1 hour**
Course Name: Strength of Materials **Max.Marks: 20 Marks**

PART-A

Answer **all** questions- Each Question carries **ONE** mark **4x1 = 4 Marks**

1. Name any two types of loads experienced by a beam for the calculation of shear force and bending moment?
2. What is a point of contraflexure?
3. Write formula for section modulus?
4. Define neutral axis and neutral layer?

PART-B

Answer **two** questions- Each Question carries **THREE** marks **2x3 = 6 Marks**

5a) Draw SF and BM diagrams for simply supported beam of length 'L' with a point load 'W' at centre.

(OR)

5. b) A cantilever beam of 3m long carries a point load of 4kN at its free end. Draw the Shear force and bending moment diagrams

6.a) State any three assumptions made in the theory of simple bending

(OR)

6. b) Write an expression for maximum slope and deflection of cantilever beam with UDL on entire span

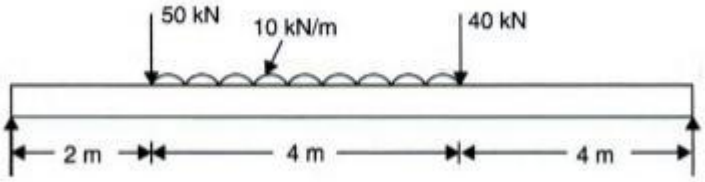
PART-C

Answer **two** questions- Each Question carries **FIVE** marks **2x5 = 10 Marks**

7.a) A cantilever beam of length 2 m carries a uniformly distributed load of 2 kN/m length over the entire span and a point load of 3 kN at the free end. Draw S.F. and B.M. diagrams for the beam.

(OR)

7.b)Draw the SF diagram for a simply supported beam of length 10 m carrying a uniformly distributed load and two point loads as shown in the following figure.



8 a)A square beam bends under the action of loads. The maximum stress induced is 150 N/mm^2 and bending moment is 4000 N-mm. Find the dimensions of the cross section on the beam

(OR)

8.b) A cantilever beam of span 5 m carries a UDL of 2kN/m. Find the maximum slope and deflection .Assume $E=2\times206$ N/mm^2 and $M.I =300\times106$ mm^4

State Board of Technical Education and Training, Telangana
Model Question paper
STRENGTH OF MATERIALS
Semester End Examination

Course Code: ME-302 **Duration:2 hour**
Course Name: Strength of Materials **Max.Marks:40 Marks**

PART-A

Answer **all** questions- Each Question carries **ONE** mark **8x1 = 8 Marks**

1. Define modulus of elasticity and bulk modulus?.
2. Define flexural rigidity
3. Write formule for polar modulus of section
4. Write the formula of bending equation
5. State the function of shaft?
6. Define spring index
7. What is thin cylindrical shell?
8. List the type of stresses induced in thin cylindrical shell

PART-B

Answer **Four** questions- Each Question carries **THREE** marks **4x3 = 12 Marks**

9. a)List the three elastic constants and write relationship between them

(OR)

b) A solid circular shaft transmits torque of 1.5 kN-m at 1440 rpm .Find the power transmitted

10. a) Write any three assumptions made in the theory of simple bending.

(OR)

b) Derive an expression for hoop stress of thin cylindrical shell

11 a) A solid shaft of 150 mm diameter is used to transmit torque. Find the maximum torque transmitted by the shaft, if the maximum shear stress induced in the shaft is $45N/mm^2$.

(OR)

b) A closely coiled helical spring of 20 coils has wire diameter of 4 mm and mean coil diameter of 30 mm .Find stiffness of spring .take $G=8.4\times104$ N/mm^2

12. a) A 900 mm diameter pipe contains fluid at pressure of 35 N/mm^2 .if the safe stress in tension is 100 N/mm^2.find the minimum thickness of pipe??

(OR)

b) Calculate the hoop and longitudinal stresses in material of a thin cylindrical shell of 3 m diameter and 30 mm thick subjected to internals presuure of 1 N/mm2.

PART-C

Answer **Four** questions- Each Question carries **FIVE** marks **4x5 = 20 Marks**

13.a) A cylindrical bar of 1.25m long with 25 mm diameter, During tensile test it is found that the linear strain is 4 times the lateral strain .Calculate the shear modulus ,bulk modulus and change in volume, if the bar is elongated by 0.06 mm under an axial load of 50 kN

(OR)

13.b) A hollow circular shaft 200 mm external diameter ,thickness of metal 20 mm is to transmit 1500kW at 160 rpm .Calculate the angle of twist in a length of 5 m.Take $G=0.85\times10^5$ N/mm^2

14. a) A beam of 10 m length simply supported at its ends carries a UDL of 4 kN/m over the left hand halfof the span and a point load of 5 kN at the mid span. find the maximum bending moment and draw shear force and bending moment diagrams for the beam

(OR)

14. b) A thin cylindrical shell having 1.5m diameter and 5 m length is subjected to a hoop stress of 45 N/mm2.Calculate the longitudinal strain. Assume Poissons ratio as 0.32 and Youngs modulus as 2.1×10^5 N/mm^2

15. a) A square beam bends under the action of loads. The maximum stress induced is 150 N/mm2 and bending moment is 4000 N-mm. Find the dimensions of the cross section on the beam

(OR)

b) A wagon weighing 30 kN moving at 7.2 kmph. Howmany spring each of 18 coils will be required in a buffer stop to absorb the energy of motion during a compression of 250 mm.the mean diameter of coil is 200 mm and the wire diameter is 25 mm .Take $G=0.9\times10^5$ N/mm^2

16. a) A cylindrical shell 2.5 m long ,1m in diameter and metal thickness 10 mm is subjected to an internal pressure of 1.2 N/mm2.Calculate the maximum intensity of shear stress induced and also the change in the dimensions of the shell

(OR)

b) A boiler shell is to made of 10 mm thick plate having limiting tensile stress of 105 N/mm2 .If the efficiencies of the longitudinal and circumferential joints are 70% and 30 % respectively.Determine the permissible intensity of internal pressure when the shell diameter is 1.3m

ME-303-THERMODYNAMICS

Course Title	**Thermodynamics**	Course Code	**ME-303**
SEMESTER	**III**	Course Group	**Core**
Teaching Scheme in periods (L : T : P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture + Tutorial**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

PREREQUISITES: Basic knowledge of Physics

COURSE OUTCOMES: At the end of the course the students will have the ability to

CO1	Describe the fundamental concepts and principles of thermodynamics
CO2	Apply the laws of thermodynamic to process and cycle
CO3	Estimate the heat, work and entropy in different thermodynamic processes
CO4	Analyze different air standard cycles and compare them.
CO5	Illustrate working principles of IC Engines.
CO6	Explain different systems used in IC Engines and evaluate the performance of IC Engines.

BLUE PRINT OF MARKS FOR SEE:

Unit No	**Unit Name**	**Periods**	**Questions to be set for SEE**				**Remarks**
			R		**U**	**A**	
1	Fundamentals of Thermodynamics	12	4	1	9(a)	13(a)	
2	Laws of Thermodynamic	13					
3	Thermodynamic Processes	13		2	10(a)	14(a)	
4	Air Standard Cycles	12					
5	WorkingPrinciples of IC Engines	13		3 5, 6	9(b), 11(a), 11(b)	13(b), 15(a), 15(b)	
6	Systems used in IC Engines and performance of IC engines	12		7, 8	10(b), 12(a), 12(b)	14(b), 16(a), 16(b)	

Legend: R-Remembering, U-Understanding, A-Applying

COURSE CONTENT

Unit-1

Fundamentals of Thermodynamics

Duration: 12 Periods (L:10-T:2)

Introduction- macroscopic -microscopic view point- control volume -Thermodynamic systems – Property, state, path and process -Different properties – Thermodynamic Equilibrium -Quasi static process-reversible -irreversible process-Thermodynamic cycle – reversible -irreversible cycle- Zeroth law of TD – thermometric property -Heat transfer and Work transfer -path function -with sign convention – Specific heat at constant volume – constant pressure-Internal Energy -flow work.

Unit-2

Laws of Thermodynamics

Duration: 13 Periods (L:10-T:3)

First law of TD -applied to closed system undergoing a cycle – undergoing a change of state - energy a property of the system-– internal energy- enthalpy-energy of an isolated system-PMM1- Limitations of first law of TD- first law applied to flow process -SFEE- application to various engineering systems-Second Law of Thermodynamics - energy reservoirs - Heat Engine -K-P Statement and Clausius statement of Second Law of TD -Refrigerator and Heat pump-Efficiency and Coefficient of performance -PMM2

Unit-3

Thermodynamic processes

Duration: 13 Periods (L:10-T:3)

Clausius inequality – definition of entropy –-principle of entropy- entropy change in reversible and irreversible process - first and second laws combined- PMM3-Third law of Thermodynamics-Expression for work done and heat supplied (without derivation) for Isochoric, Isobaric, Isothermal, Isentropic, Polytropic processes – Relation between Pressure, Volume and Temperature in Adiabatic process and Polytropic process

Unit-4

Air Standard Cycles

Duration: 12 Periods (L:10-T:)

Calorific values (Heating value) of fuels -Air standard cycle – assumptions -compression ratio -cut off ratio-swept volume- clearance volume - Carnot's cycle - Explanation and analysis of air standard cycle- Otto cycle, Diesel cycle – Expression for efficiency of these cycles (without derivation) – Comparison of performance of Otto cycle and Diesel cycle.

Unit-5

Working Principles of IC Engines

Duration: 13 Periods (L:10-T:3)

Heat engines – Internal combustion engines and external combustion engines – classification of IC engines – Components of IC engines and their function – Principle of working and comparison of four stroke SI engine and CI engine -Value timing diagram of four stroke SI engine and 4 stroke CI engine - Principle of working of two stroke petrol engine – Comparison between four stroke engine and two stroke engine.

Unit-6

Systems used in IC Engines and performance of IC engines

Duration: 12 Periods (L:10-T:2)

Fuel systems – Battery Ignition system - Cooling systems – Lubrication systems – Firing order- Performance of IC engines – Indicated power, Brake power, Frictional power, Indicated mean effective pressure, Brake mean effective pressure, Specific fuel consumption, Mechanical efficiency - Thermal efficiency-Indicated thermal efficiency-Brake thermal efficiency- Air Fuel ratio-Volumetric efficiency

REFERENCE BOOKS

1. Engineering Thermodynamics by P.K. Nag TMH Publishers
2. Thermal Engineering by R.K Rajput
3. Thermodynamics and Heat Engines Vol 1 and Vol 2 by R Yadav
4. IC Engines by Gill and Smith

SUGGESTED LEARNING OUTCOMES:
1.0 Fundamentals of Thermodynamics

- **1.1** Define Engineering Thermodynamics.
- **1.2** Explain Macroscopic approach and Microscopic approach.
- **1.3** Define Control volume.
- **1.4** Define the various terms associated with the thermodynamic system. Explain with examples Open system, closed system and isolated system.
- **1.5** Define thermodynamic property – Classify TD properties. Define properties like Temperature, Pressure, Volume, Specific volume, Density etc.
- **1.6** Define state of system, path and process traced by system – TD Cycle.
- **1.7** Explain Quasi static process.
- **1.8** Compare Reversible and Irreversible process.
- **1.9** Differentiate between Intensive and Extensive properties.
- **1.10** Explain Thermodynamic equilibrium-Thermal, Mechanical and Chemical equilibrium.
- **1.11** Illustrate Zeroth law of Thermodynamics.
- **1.12** What is Thermometric property.
- **1.13** Define Heat and Work and know sign convention of heat and work.
- **1.14** Differentiate between Point function and Path function.
- **1.15** Define Specific heats, Internal Energy, Enthalpy, Flow work.
- **1.16** Solve problems on properties of Thermodynamic systems.

2.0 Laws of Thermodynamics

2.1 State First Law of Thermodynamics.

2.2 Application of First Law of Thermodynamics to Closed system undergoing a cycle.

2.3 Application of First Law of Thermodynamics to Closed system undergoing a change of state.

2.4 Why Energy is a property of a system.

2.5 Define Internal Energy-Enthalpy of a system.

2.6 Show Internal Energy of an Isolated system is constant.

2.7 Define PMM I.

2.8 What are the limitations of First Law of Thermodynamics.

2.9 Application of First law to a Flow process and write the SFEE.

2.10 Application of SFEE to various Thermodynamic process-Steam turbine-Compressor-Pump-Nozzle-Condenser-Throttling process (only equation).

2.11 Solve problems on First law applied for a process.

2.12 Solve problems on First law applied to TD cycle (Non Flow Energy Equation-NFEE).

2.13 State Second law of Thermodynamics.

2.14 Define Thermal Energy reservoir (TER) – source-sink.

2.15 State Kelvin Planck's statement and Clausius statement.

2.16 Define heat engine, refrigerator and heat pump.

2.17 Define efficiency – Solve problems.

2.18 Define coefficient of performance -Solve problems.

2.19 Define PMM II.

3 Thermodynamic Processes.

3.0 Define Clausius inequality.

3.1 Define Entropy and principle of Entropy.

3.2 Change of Entropy for reversible and irreversible process.

3.3 Combine First and Second law and write two equations for T*ds.*

3.4 Define PMM III.

3.5 State Third law of Thermodynamics.

3.6 List different thermodynamic processes and write their adiabatic index.

3.7 What is the expression for work done and heat supplied (without derivation) for Isochoric process and solve numerical problems.

3.8 What is the expression for work done and heat supplied (without derivation) for Isobaric process and solve numerical problems.

3.9 What is the expression for work done and heat supplied (without derivation) for Isothermal process and solve numerical problems.

3.10 What is the expression for work done and heat supplied (without derivation) for Adiabatic process and solve numerical problems

3.11 What is the expression for work done and heat supplied (without derivation) for Polytropic process and solve numerical problems

3.12 Write the relation in terms of pressure, volume and temperature in Adiabatic process and Polytropic process.

3.13 Explain Throttling process and free expansion process.

3.14 Analyze that area under PV diagram gives work transfer and area under TS diagram gives heat transfer.

3.15 Draw P-v & T-s diagram for expansion and compression during isobaric, isochoric, isothermal, adiabatic, polytropic process.

4.0 Air Standard Cycles

4.1 Define the term fuel-combustion-calorific value (HCV-LCV).
4.2 Define the term air standard cycle. What are the assumptions in air standard cycle.
4.3 Define compression ratio – cutoff ratio swept value - clearance value.
4.4 Draw PV diagram and TS diagram of Carnot cycle and list the process.
4.5 Explain working of Carnot cycle in detail.
4.6 List limitations of Carnot cycle.
4.7 Write the formula for the air standard efficiency of a Carnot cycle (without derivation)
4.8 Solve simple problems on analysis of Carnot cycle.
4.9 Draw PV diagram and TS diagram of Otto cycle and list the processes.
4.10 Explain working of Otto cycle in detail.
4.11 Write the formula for the air standard efficiency of Otto cycle (without derivation)
4.12 Solve simple problems on analysis of Otto cycle.
4.13 Draw PV diagram and TS diagram of diesel cycle and list the processes.
4.14 Explain working of diesel cycle in detail.
4.15 Write the formula for the air standard efficiency of a diesel cycle (without derivation).
4.16 Solve simple problems on analysis of diesel cycle.
4.17 Compare Otto cycle and Diesel cycle for same compression ratio.
4.18 Compare Otto cycle and Diesel cycle for same compression ratio and heat supplied.
4.19 Compare Otto cycle and Diesel cycle for same maximum pressure and heat supplied.
4.20 Compare Otto cycle and Diesel cycle for same maximum pressure and maximum temperature.

5.0 Working Principles of IC Engines

5.1 Define Heat engine- Difference between internal combustion engine and External combustion engine.
5.2 Classify Internal Combustion Engines.
5.3 Explain the various terms like TDC, BDC, stroke, and bore of an IC engine with a line diagram.
5.4 Explain briefly various parts of IC engine.
5.5 Write the four sequence of operations (strokes) of piston of an IC engine
5.6 What is the basic difference between 4 stroke and 2 stroke engine.
5.7 What is the charge in SI engine.
5.8 Explain the working of four stroke petrol engine (SI) with line diagram.
5.9 Draw theoretical indicator diagram of four stroke petrol(SI) engine.
5.10 Draw valve timing diagram of four stroke petrol(SI) engine and explain.
5.11 What is the the charge in CI engine
5.12 Explain the working of four stroke Diesel engine (CI) with line diagram.
5.13 Draw theoretical indicator diagram of four strokeDiesel (CI) engine.

5.14 Explain valve timing diagram of four strokeDiesel (CI) engine.

5.15 Explain the differences between SI engine and CI engine.

5.16 Differentiate between valve and ports of IC engine.

5.17 Explain the working of two stroke petrol engine (SI) with line diagram.

5.18 Draw the Indicator diagram of two stroke petrol engine.

5.19 Compare two stroke engine and four stroke engine.

6.0 Systems used in IC Engines and performance of IC engines

6.1 List the elements of the fuel system in a petrol engine (Fueltank, Fuel pump, Fuel filter, Air cleaner and carburetor).

6.2 Explain the fuel system used in a petrol engine with a simple line diagram.

6.3 List the elements of the fuel systems of Diesel engine(Fuel Feed pump, Filter, Fuel Injection pump and Fuel injector).

6.4 Explain the fuel system used in a diesel engine with a simple line diagram.

6.5 List the ignition systems used in petrol engine.

6.6 Explain with line diagram the working of Battery Ignition system.

6.7 What is the necessity of cooling of an IC engine.

6.8 List different types of cooling system used in an IC engine.

6.9 Explain Air cooling system with a legible sketch.

6.10 Explain forced circulation water cooling system with a legible sketch.

6.11 Explain forced circulation liquid coolant system with a legible sketch

6.12 Compare Air cooling with water cooling system.

6.13 Why Lubrication of an IC engine is necessary.

6.14 What are the parts to be lubricated in an IC engine.

6.15 List the types of lubrication system: Mist lubrication system (petrol system) Wet sump lubrication system and Dry sump lubrication system.

6.16 What is the difference between wet sump and dry sump lubrication system.

6.17 Firing order of IC engine – Its importance – General firing order in 4 cylinder engine and 6 cylinder inline engine.

6.18 Define the performance parameters of IC engines like Indicated power, Brake power, frictional power and write formulae.

6.19 Define the performance parameters of IC engines like Indicated mean effective pressure, brake mean effective pressure, Specific fuel consumption, and write formulae.

6.20 Define the performance parameters of IC engines like Mechanical efficiency, Thermal efficiency, indicated thermal efficiency, brake thermal efficiency ,air fuel ratio ,volumetric efficiency and write formulae.

6.21 Solve simple problems involving above parameters.

SUGGESTED STUDENT ACTIVITIES:

1. Make a list of different bikes available in market and know their capacities.
2. Make list of different cars available in market and know their capacities.
3. Visit to automobile workshops /service centers and see how an IC engine works Make a note on fuels available in market and know their calorific values.
4. Collect the data of pressure required in tyres of a two wheeler and four wheeler
5. Collect data of different engine oils used in automobiles.
6. Collect information of different liquid coolants used in automobiles.
7. Study of cutout models of IC engines.
8. Visit to an automobile workshop.
9. Working of IC Engine

   https://www.youtube.com/watch?v=O9tfIfwlmz8
10. Know fuel system

    https://www.youtube.com/watch?v=DCfyUm3I4oI
11. *Know battery ignition system*

    https://www.youtube.com/watch?v=OMLSNwQiiKg
12. *Know cooling system in automobile*

    https://www.youtube.com/watch?v=V7inC4lOpGs
13. *Know lubrication system*

    https://www.youtube.com/watch?v=mmmcj53

    TNic

CO-PO MATRIX:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	3	1	-	1	-	-	-	1,2,4
CO2	3	2	-	1	1	1	1	1,2,4,5,6,7
CO3	2	2	1	-	1	-	1	1,2,3,5,7
CO4	2	2	1	1	-	1	1	1,2,3,4,6,7
CO5	2	1	1	-	1	1	1	1,2,3,5,6,7
CO6	2	1	1	-	1	1	1	1,2,3,5,6,7

BOARD DIPLOMA EXAMINATION

MID SEM-I MODEL PAPER

THERMODYNAMICS (ME-303)

TIME :1 Hours **Max. Marks: 20**

PART – A

8 X1 = 8

NOTE: 1)Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define state of a thermodynamic system.
2. Write sign convention for heat transfer.
3. Define PMM I
4. Define TER

PART – B

NOTE: *Answer **all** questions . Each question carries **three** marks*

4X3 =12

5. (a) what is Thermodynamic Equilibrium.

OR

5. (b) State quasi static process
6. (a) state first law of thermodynamics

OR

6 (b) write the relation between efficiency of heat engine COP of Refrigerator

PART – C

NOTE: Answer **all** questions. Each question carries **five** marks 4X5 = 20

7 (a) what is the significance of zeroth law of thermodynamics

OR

7 (b. why heat and work are path functions

8 (a) A thermodynamic system undergoes a cycle composed of a series of three processes for

which heat transfers are Q_1 = + 10 kJ , Q_2 = + 30 kJ , Q_3 = - 5kJ. For the first process ΔE= +20 kJ and for the third process ΔE = - 20 kJ. What is the work transfer in thesecond process and network output of cycle.

OR

8 (b) what are the limitations of first law of thermodynamics

DME III SEMESTER
MID SEM II EXAMINATION
THERMODYNAMICS (ME-303)
MODEL PAPER

Time : 1 hr **Total Marks : 20**

PART – A

8 X1 = 8

NOTE: 1)Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define Entropy.
2. Define PMM III.
3. What is combustion
4. State any two assumptions made in analysis of air standard cycle.

PART – B

NOTE: *Answer **all** questions . Each question carries **three** marks*

4X3 =12

5 (a) Define Clausius inequality

OR

5 (b) what is the change in internal energy of a system if heat is supplied at constant volume.

6. (a) State any three differences between Otto cycle and Diesel cycle.

OR

6 (b) Draw P-v and T-s diagram for Diesel cycle.

PART – C

NOTE: Answer **all** questions . Each question carries **five** marks 4X5 = 20

7. (a) A heat engine ,heat pump and a refrigerator are embedded between two heat reservoir one at 1000 K while other at 350 K determine the efficiency of heat engine and COP of heat pump and refrigerator

OR

7 (b) Heat source is available at 1000 K and it loses 20 kJ of heat to a sink 500 K find entropy change for source and sink

8 (a) Describe the processes involved in a Carnot cycle and draw P-v diagram.

OR

(b) A diesel engine has a compression ratio 14 to 1 , and the heat supply is cut-off at 0.06 stroke. Find the air standard efficiency of the cycle. Assume adiabatic ratio as 1.4

BOARD DIPLOMA EXAMINATION
SEMESTER END EXAM MODEL PAPER
THERMODYNAMICS (ME-303)

TIME :2 Hours **Max. Marks: 40**

PART – A

8 X1 = 8

NOTE: 1)Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define thermo metric property.
2. Define Entropy.
3. State any two functions of lubricants.
4. Define compression ratio
5. Define BDC
6. What is the charge in SI engine.
7. State two functions of cooling systems in IC engine
8. Define Brake power.

PART – B

NOTE: *Answer **all** questions . Each question carries **three** marks* 4X3 =12

9(a) Differentiate between Point function and Path function.

OR

9(b) Write the four sequence of operations (strokes) of piston of an IC engine

10(a) List the limitations of Carnot Cycle

OR

10(b) List different types of cooling system used in an IC engine

11(a)What is the basic difference between 4 stroke and 2 stroke engine.

OR

11(b) Draw valve timing diagram of four stroke petrol(SI) engine

12(a) Draw the line diagram of petrol engine fuel system.

OR

12(b) List different types of cooling system used in an IC engine

PART – C

NOTE: Answer **all** questions . Each question carries **five** marks 4X5 = 20

13 (a) A heat engine ,heat pump and a refrigerator are embedded between two heat reservoir one at 600 K while other at 300 K determine the efficiency of heat engine and COP of heat pump and refrigerator

OR

13 (b).Explain the differences between SI engine and CI engine

14 (a) Draw P-v diagram and T-s diagram of diesel cycle and list the processes

OR

14 (b) The following results were obtained from a test on a petrol engine.

Indicated power = 30.3 kW , Brake power = 26.05 kW

Brake specific fuel consumption = 0.315 kg/kW.h , calorific value of fuel = 44100 kJ/kg

Calculate (i) Indicated thermal efficiency

(ii) Brake thermal efficiency

(iii) Mechanical efficiency.

15 (a) Explain parts of IC engine with line diagram.

OR

15 (b) Explain the working of two stroke petrol engine (SI) with line diagram.

16 (a) Explain air cooling system used in IC engine with a diagram.

OR

16 (b) Explain with line diagram the working of Battery Ignition system

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ME-304-FLUID MECHANICS AND HYDRAULIC MACHINERY

Course Title	Fluid Mechanics and Hydraulic Machinery	Course Code	ME-304
Semester	III	Course Group	Core
Teaching Scheme in Periods (L: T: P)	4:1:0	Credits	2.5
Methodology	Lectures + Tutorials	Total contact periods	75
CIE	60 marks	SEE	40 marks

PREREQUISITES: Basic knowledge of physics.

COURSE OUTCOMES: At the end of the course the students will be able to

CO1	Selection of suitable fluid for various applications based on fluid properties.
CO2	Applying concept of Bernoulli's equation for flow of liquids
CO3	Estimate frictional losses and design the pipe for flow of liquids through pipes.
CO4	Analyze forces on plates or vanes due to impact of jets
CO5	Describe the working of water turbines and estimate the power developed by turbines
CO6	Describe a hydraulic pump and estimate the power required to operate hydraulic pumps.

COURSE CONTENT

UNIT-1 **Duration: Periods 12 (L: 09 – T: 03)**

Properties of fluids

Definition of fluid, ideal and real fluids, compressible and incompressible fluids -Units used in fluid mechanics. Density, specific weight, specific gravity, viscosity and surface tension, compressibility and capillarity. Intensity of pressure, gauge and absolute pressures. Measurement of pressures by piezometer, U-Tube – manometer – simple problems – Bourdon tube pressure gauge.

UNIT-2 **Duration: Periods 12 (L: 10 – T: 02)**

Flow of Liquids

Types of Fluid flow- Steady and Unsteady flow, Uniform and Non-Uniform Flow,1D,2D&3D Flow, Rotational and Irrotational flow, Laminar & Turbulent flow- Concept on Reynolds's Number, Discharge, Continuity equation for compressible and incompressible fluids- Simple problems on continuity equation- Pressure, potential and kinetic energy of liquids - Total energy, Bernoulli's equation (no derivation) – assumptions made, Simple problems on Bernoulli's equation, Working principle of Venturi meter, Simple Problems on Venturi meter, Pitot tube – principle –applications.

UNIT-3 **Duration: Periods 12 (L: 09 – T: 03)**

Flow through pipes

Concept of loss of head in pipes due to friction, Darcy's & Chezy's formula (without proof), Simple problems on Darcy's and Chezy's formulae, Hydraulic gradient line and Total energy line-illustration, Calculation of discharge, velocity, diameter of pipe etc., for pipes connecting two reservoirs (considering frictional losses only), Siphon – principle of working (Numerical problems omitted), Expression for power transmitted through pipes. Expression for transmission efficiency, condition for maximum efficiency (without proof.), Simple problems on power transmission

UNIT-4 **Duration: Periods 13 (L: 10 – T: 03)**

Impact of jets

Derivation of formulae for the force of jet on Stationary vertical flat plate, stationary inclined flat plate, Stationary curved plate and Simple problems on the above, Derivation of formulae for the force of jet on moving vertical flat plate. Derivation of formulae for the force of jet on series of moving plates fixed on the rim of a wheel, Simple problems on the above, Force of jet striking on a moving curved blade when jet strikes tangentially at one end of the tip - velocity triangles, Work done, power and efficiency in the above cases, Simple problems on the above.

UNIT-5 **Duration: Periods 13 (L: 10 – T: 03)**

Water turbines

Introduction to water turbines- Hydro-electric power stations line sketch showing layout of hydro-electric power plant with head race, dam, sluice gate, pen stock turbine, generator and tail race, Classification of turbines-impulse and reaction turbines, Brief sub-classification as axial, radial and tangential flow type, Working principle of Pelton wheel-velocity triangles, Simple problems, Working principle of Francis turbine - velocity triangles, Simple problems, Working principle of Kaplan turbine - velocity triangles, Simple, problems, Differences between Pelton wheel and Francis Turbines, Differences between Francis and Kaplan turbines, Governing of methods of Water turbines

UNIT-6 **Duration: Periods 13 (L: 10 – T: 03)**

Pumps

Pump-Function – Classification, Principle of operation of a reciprocating pump, Constructional details of single acting, double acting pumps. Expression for theoretical power required to drive the pump (without proof)-slip- Simple problems, working principle of centrifugal pump, Installation of centrifugal pump, Priming of centrifugal pump – necessity- Cavitation in centrifugal pump -, Simple problems on work, power and efficiency of Centrifugal pumps, Difference between Reciprocating pump and Centrifugal pump.

SUGGESTED STUDENT ACTIVITIES:

1. Visit nearby Hydroelectric power station and observe dam, penstock, turbines, generators etc.
2. Visit nearby pumping station and identify the pumps used.
3. Quiz
4. Group discussion
5. Surprise test
6. Seminars

SUGGESTED LEARNING OUTCOMES:

Upon the completion of the course the student should be able to

1. **Understand the various properties of fluids**
   - 1.1 Define fluids.
   - 1.2 Differentiate between ideal and real fluids
   - 1.3 Differentiate between compressible and incompressible fluids
   - 1.4 State the various units used in Hydraulics
   - 1.5 Define various properties of fluids and state their units
   - 1.6 Solve problems on properties of fluids
   - 1.7 Define intensity of pressure and their units, differentiate between gauge pressure and absolute pressure.
   - 1.8 Solve problems on pressure.
   - 1.9 Explain the working principle of manometer Solve simple problems on simple U–tube manometer.
   - 1.10 Borden tube pressure gauge

2. **Understand the behavior of liquids in motion**
   - 2.1 Distinguish types of fluid flows and concept on Reynolds's number.
   - 2.2 State the various type of energies and the total energy.
   - 2.3 Know about the Discharge and velocity of a flowing liquid
   - 2.4 Understand the equation of continuity and solve simple problems
   - 2.5 State Bernoulli's equation and its application in hydraulics
   - 2.6 Solve simple problems on Bernoulli's equation
   - 2.7 Explain the working principle Venturi meter and simple problems on Venturi meter.
   - 2.8 Explain the working principle pitot tube simple problems pitot tube.

3. **Evaluate frictional losses during flow of liquids through pipes**
   - 3.1 Mention the equation for loss of head due to friction in pipes
   - 3.2 State Darcy's and chezy's formulae and simple problems
   - 3.3 Explain the hydraulic gradient and total energy line
   - 3.4 Calculate the velocity of flow, discharge and diameter of pipes connecting two reservoirs
   - 3.5 Explain the function of siphon and give reason for limiting the height of the pipes
   - 3.6 Explain how the power can be transmitted through pipes carrying liquid under pressure.
   - 3.7 Express the condition for maximum H.P. through pipes
   - 3.8 Solve simple problems on power transmission through pipes

4. Analyze forces during the impact of jets

4.1 Derive expression for force of jet on stationary or fixed vertical plate and problems.

4.2 Derive expression for force of jet on stationary or fixed inclined flat plate and problems

4.3 Derive expression for force of jet on stationary or fixed curved plate and problems

4.4 Derive expression for force of jet on moving flat plate and problems.

4.5 Derive expression for the force of jet on a series of plates fixed on the rim of a wheel and problems.

4.6 Derive expression for the force of jet of water on a moving curved vane when jet strikes tangentially at one end of the tip.

4.7 Find the expressions for work done, power and efficiency

4.8 Solve simple problems on moving curved vane when jet strikes tangentially at one end of the tip.

5. Understand the working of water Turbines

5.1 State the importance of water turbines

5.2 Draw the layout of a hydroelectric power station

5.3 Classify the water turbines based on the direction of flow of water & other criteria

5.4 Explain the working of Pelton wheel and simple problems.

5.5 Explain the working of Francis turbine and simple problems.

5.6 Explain the working of and Kaplan turbine and simple problems.

5.7 Difference between Pelton wheel and Francis Turbine

5.8 Difference between Francis and Kaplan turbines

5.9 Describe the governing of water turbines

6. Know the working of pumps

6.1 Explain the function of pump and Classify the pumps

6.2 Mention the constructional details of single acting pump and simple problems

6.3 Mention the constructional details of double acting pumps and simple problems

6.4 Expression for theoretical power required and slip and simple problems.

6.5 Explain the principle of operation of centrifugal pumps

6.6 Mention the constructional and installation of a centrifugal pump

6.7 Derive the expression for work done by the centrifugal pump.

6.8 Define the heads and efficiency of a centrifugal pump

6.9 Solve simple problems on centrifugal pumps

6.10 Appreciate the importance of priming and explain priming methods

6.11 Explain cavitation in centrifugal pump

6.12 Compare the centrifugal pump with a reciprocating pump

REFERENCE BOOKS:

1. Fluid Mechanics and Hydraulic Machines Dr.R.K.Bansal
2. Hydraulic Machines by S.AnanthaSwamy
3. Hydraulic Machines by R.C. Patel
4. Hydraulics ByMalhotra&Malhotra
5. Hydraulics & Hydraulic Machinery by Yeaple
6. Hydraulics and Pneumatics by Reya and Rao.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	3	1	1	-	1	-	-	1,2,3,5
CO2	3	2	2	-	-	-	-	1,2,3
CO3	3	3	3	-	-	-	-	1,2,3
CO4	3	3	1	-	-	-	-	1,2,3
CO5	3	3	3	-	2	1	-	1,2,3,5,6
CO6	3	3	2	-	-	1	-	1,2,3,6

ME-304 FLUID MECHANICS AND HYDRAULIC MACHINERY

MODEL PAPER - MID -I (CIE)

Time: 1 Hour **Max. Marks: 20 M**

PART – A 4 X 1 = 4

NOTE: (i) Answer all questions and each question carries one mark.

(ii) Answers should be brief and straight to the point

1. Define ideal fluid.
2. Write the relation between specific weight and density.
3. What is a turbulent flow?
4. What is a pitot tube?

PART – B 2 X 3= 6

NOTE: (i) Answer all questions and each question carries three marks

(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

5. (a) Calculate the density and specific weight of 1 lt. of petrol with specific gravity 0.7?

OR

5. (b) Convert a vacuum of 90 mm of mercury into absolute pressure in meters of water?
6. (a) What is the difference between steady flow and unsteady flow?

OR

6. (b) Draw a neat sketch of a venturi meter and label its parts.

PART – C 2 X 5 = 10

NOTE: (i) Answer all questions and each question carries five marks

(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

7. (a) Explain the working of Bourdon tube pressure gauge with a neat sketch.

OR

7. (b) A flat plate of area 1.5 x 106 mm^2 is pulled with a speed of 0.4m/s relative to another plate located at a distance of 0.15mm from it. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity as 1 poise.
8. (a) A pipe has a diameter 15cm at one end, 30cm at the other end. Water is flowing in this pipe with mean velocity of 20m/sec at first end. Find out A) Discharge of water through pipe, B) velocity at the other end

OR

8. (b) A pipe 300 m long has a slope of 1 in 100 and tapers from 1 m diameter at higher end to 0.5 m at the lower end. The quantity of water flowing is 900 lit/ sec. If the pressure at the higher end is 70 kPa, find the pressure at the lower end.

ME-304 FLUID MECHANICS AND HYDRAULIC MACHINERY

MODEL PAPER - MID -II (CIE)

Time: 1 Hour **Max. Marks: 20 M**

PART – A 4 X 1 = 4

NOTE: (i) Answer all questions and each question carries one mark.

(ii) Answers should be brief and straight to the point

1. Define Hydraulic mean depth.
2. Define Total energy line?
3. Write an expression for force exerted on flat moving plate.
4. State the condition for maximum efficiency for a series of moving blades struck by a jet of water

PART – B 2 X 3= 6

NOTE: (i) Answer all questions and each question carries three marks

(ii) The answers should be comprehensive and the criteria for valuation is the content

but not the length of the answer.

5. (a) Water flows through a pipe of 100mm diameter and 60m long with velocity of 2 m/sec. Find the head lost due to friction by using Darcy's formula, f = 0.005.

OR

5. (b) State the reason for limiting the height of the pipes for siphon system?

6. (a) A jet of diameter 40mm strikes horizontally on a plate held vertically. What force is required to hold plate for a flow of oil of specific gravity 0.8 with a velocity of 30m/s.

OR

6. (b) Draw the inlet and outlet velocity triangles for a moving curved vane, when a jet enters tangentially at one tip and leaving at the other tip.

PART – C 2 X 5 = 10

NOTE: (i) Answer all questions and each question carries five marks

(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

7. (a) Two reservoirs are connected by a pipeline consisting of two pipes, one of 15cm dia. and 10m length and the other of 22.5cm diameter and length 20m. If the difference between water levels in the two reservoirs is 10m. Calculate the discharge, take f= 0.02, neglect minor losses.

OR

7. (b) Water is to be supplied from a reservoir to a turbine. The turbine is situated 150m below the reservoir level. The length of penstock is 1500m. Determine the smallest diameter of penstock to produce 500kW of power with a turbine of efficiency 95% take f= 0.02.

8. (a) A jet of 78.64cm² area, moving with a velocity of 12 m/sec impinges on a series of vanes moving with a velocity of 8 m/sec. Determine (i) Force on the plate(ii) Work done per sec,(iii) Efficiency.

OR

8. (b) A jet of water of diameter 15 cm, strikes a curved plate at it centre with a velocity of 25 m/sec. The curved plate is moving with a velocity of 11 m/sec in the direction of jet. The jet is deflected through an angle of 165°. Assuming the plate smooth, find (i) Force exerted on the plate in the direction of jet, (ii) Power of the jet, and (iii) Efficiency of the jet.

BOARD DIPLOMA EXAMINATIONS
SEMESTER END EXAMINATION (SEE)
MODEL PAPER- ME-304
FLUID MECHANICS AND HYDRAULIC MACHINERY

TIME : 2 Hours **Max. Marks: 40**

PART – A 8 X 1 = 8

NOTE : 1) Answer **all** questions and each question carries **one** mark.
2) Answers should be brief and straight to the point and shall not exceeding three simple sentences

1. Write the Continuity equation for Incompressible fluids.
2. Write the Darcy Weisbach formula.
3. State the pump use.
4. Define Surface tension?
5. What is the Cross-sectional area of bucket in Pelton wheel?
6. Define overall efficiency in hydraulic turbine.
7. Define negative slip for the reciprocating pump.
8. What is positive displacement pump?

PART – B 4X 3= 12

NOTE: (i) Answer **all** questions and each question carries **three** marks
(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

9 (a) State Bernoulli's equation and write any two assumptions made in Bernoulli's equation

OR

9 (b) Draw the layout of hydroelectric power plant and indicate the main parts.

10 (a) Write short notes on syphon system.

OR

10 (b) What are the functions of the casing of a centrifugal pump?

11(a) List any three features of Kaplan turbine.

OR

11 (b) State the need of governing in water turbines.

12 (a) What are the advantages of centrifugal pump over reciprocating pump?

OR

12 (b) Why can the suction height of a pump not exceed certain limit?

PART – C 4 X 5 = 20

NOTE: (i) Answer **all** questions and each question carries **five** marks

(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

13 (a) Explain the working of Simple U-tube manometer with a neat sketch.

OR

13 (b) Explain governing of the reaction turbines with line diagram.

14 (a) Water supplied from a reservoir through a 300mm diameter pipe 600m long to a turbine which is situated 108m below the free surface. Discharge through the pipe is 81 lit/sec. Find the head lost and the power transmitted by the pipe? Darcy's friction factor, f=0.01.

OR

14 (b) Explain the working of single acting reciprocating pump with a sketch.

15 (a) A Francis turbine working under a head of 130m runs at 400rpm. The diameter of the runner at inlet is 1.5m and the flow area is $0.5m^2$. The guide blade angle is 20^o and vane angle at inlet is 60^o. i) Determine power developed ii) Hydraulic efficiency. The velocity of whirl at outlet is zero.

OR

15 (b) A Kaplan turbine is required to develop 7000 KW under a head of 4m, speed ratio is 2, flow ratio is 0.7 and the ratio of boss diameter to runner diameter is 0.35. Find the speed of runner assuming 90% overall efficiency.

16 (a) A double acting reciprocating pump delivers oil of specific gravity 0.82 through a height of 8 m from the pump. The suction height is 5 m and the piston speed is 4 m/sec. The diameter of the cylinder is 10 cm. taking the efficiency of the pump as 60%, find the power of the machine driving the pump.

OR

16 (b) Explain the working principle of centrifugal pump with neat sketch?

ME-305-ENGINEERING MATERIALS

Course Title	**Engineering Materials**	Course Code	**ME-305**
Semester	**III**	Course Group	**Core**
Teaching Scheme in Periods (L: T: P)	**4:1:0**	Credits	**2.5**
Methodology	**Lectures + Tutorials**	Total contact periods	**75**
CIE	**60 marks**	SEE	**40 marks**

PREREQUISITES:

Basic knowledge of Physics and Chemistry

COURSE OUTCOMES:

On successful completion of the course, the students will be able to:

CO1	Classify the properties of engineering materials and know the testing methods to analyse the mechanical properties"
CO2	Grasp the significance and basic principles underlying the structure of materials.
CO3	Comprehend the methods involved in the production of iron and steel through different processes.
CO4	Apply knowledge of the Iron-Carbon equilibrium diagram to interpret the various microstructures present in iron and steel.
CO5	Utilize knowledge of heat treatment processes to distinguish between different methods used in treating steel.
CO6	Break down the properties and characteristics of various ferrous and nonferrous metals and alloys and understand their suitability for different purposes.

COURSE CONTENT

Unit – 1

Duration:12 Periods (L: 10 – T:2)

Mechanical properties and testing of engineering materials

Engineering Materials –Importance and applications of engineering materials, mechanical properties: strength (Tensile strength, Compressive strength and shear strength), stiffness elasticity, plasticity, Ductility, Malleability, Hardness, Toughness, Brittleness, Impact strength, Fatigue, Creep. Testing of Engineering materials: Destructive tests– Tensile and Compressive test, shear test, stress- strain curve for different materials – Brinell, Rockwell and Vickers's hardness test –Izod & Charpy impact test. Non-destructive testing: purpose – Different methods - Like Microscopy techniques (SEM, TEM): Scanning Electronic Microscope (SEM) and Transmission Electronic Microscope (Simplified overview without detailed explanation)

Unit – 2

Duration:13 Periods (L: 10 – T:3)

Structure of materials

Space lattices, Unit cells – BCC, FCC, HCP structures. Crystallization of metal: dendrite growth, grain boundary, grain size and its effect on properties–factors affecting grain size – Recrystallisation – Microstructure Enhancement Techniques: Etching solutions.

Unit – 3

Duration: 12 Periods (L:10 – T:2)

Production of Iron and Steel

Raw materials used in production of Iron and steel – Production of: Pig Iron by Blast Furnace, Wrought Iron by Puddling furnace, Cast Iron from Cupola, Steel by Bessemer Process, L.D. Process, Open Hearth Process, Electric Arc process and Electrical Induction process, Concasting (Continuous Casting Process).

Unit – 4

Duration: 13 Periods (L: 10 – T:3)

Iron-Carbon Equilibrium Diagram

Phase, equilibrium, Gibb's phase rule, alloy, solid solution: Interstitial, substitutional, chemical compound, mechanical mixture – Cooling curves of pure metals – Allotropic forms of pure iron and critical points – Micro constituents of Iron & Carbon alloy – Iron Carbon equilibrium diagram.

Unit – 5

Duration: 13 Periods (L: 10 – T:3)

Heat Treatment of Steel.

Stages in heat treatment – critical rate of cooling – martensite, bainite, sorbite and troostite- Isothermal transformation (TTT curves) - Austenite decomposition on continuous cooling transformation (CCT) diagram Heat treatment processes: Annealing – Full Annealing, Sub critical annealing, spheroidise annealing and isothermal annealing. Normalizing, Hardening, Tempering – Austempering and Martempering, Surface hardening, Case hardening and Vacuum Furnace (only definition).

Unit – 6

Duration: 12 Periods (L: 10 – T:2)

Ferrous, Non-Ferrous metals - their alloys & Powder metallurgy

Ferrous Metals and alloys–cast iron and types – effect of carbon on properties of cast iron-composition, properties and applications of white cast iron, gray cast iron, nodular iron and malleable Iron – Plain carbon steels – effect of carbon on properties. classification of plain carbon steels – Alloy steels: Effect of adding alloying elements chromium, cobalt, manganese, molybdenum, nickel, tungsten, vanadium – composition, properties and application of chromium steel, nickel steel, manganese steel, stainless steel and HSS steel.

Non-Ferrous metals and alloys - composition, properties and application of duralumin, dow metal, Brass: cartridge brass, admiralty brass, muntz metal, and naval brass. Bronze: gun and bell metal Nickel: constantan, Monel, nichrome and invar. Babbit

Powder metallurgy: Definition and applications – Manufacturing process in powder metallurgy, methods to produce metal powders – methods to compact powders (without explanation) – Reaction sintering, Pre sintering and sintering (definition) – Advantages, limitations of powder metallurgy.

Note: At the end of every unit Tutorial classes should be held to interact with the students by various methods (slip test, seminar, quiz, virtual labs etc.) to enhance the skill and to create student centric learning.

REFERENCEBOOKS:

1. Introduction to Physical metallurgy by Avner
2. Physical metallurgy by V. Raghavan
3. Material science and engineering by V. Raghavan
4. Material science and metallurgy by Dr. O.P. KHANNA
5. Powder Metallurgy by TTTI, ECH

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. **Mechanical properties and testing of engineering materials.**
   - 1.1 Know the importance of materials in industry.
   - 1.2 Applications of engineering materials.
   - 1.3 Classification of engineering materials.
   - 1.4 Identify the various factors for selection of engineering materials
   - 1.5 Know different mechanical properties like strength (tensile, compressive and shear strengths) stiffness, elasticity, plasticity, ductility, malleability, hardness, toughness, brittleness, impact strength, fatigue, creep.
   - 1.6 Draw stress-strain curves for different materials.
   - 1.7 Know the various Destructive tests and Non -destructive tests.
   - 1.8 Describe tensile test and compression test on mild steel using universal testing machine (UTM)
   - 1.9 Describe shear test
   - 1.10 Describe Brinell hardness test.
   - 1.11 Describe Rockwell hardness test
   - 1.12 Describe Vickers hardness test.
   - 1.13 Conduct Izod and Charpy impact tests.
   - 1.14 State the purpose of different Non -destructive tests used in industry
   - 1.15 Differentiate between a Scanning Electron Microscope (SEM) and a Transmission Electron Microscope (TEM) based on their fundamental principles
2. **Structure of materials**
   - 2.1 Comprehend the concepts of Space lattices and Unit cells.
   - 2.2 Draw the structure, calculate effective number of atoms of BCC structure and mention some materials which have the BCC structure
   - 2.3 Draw the structure, calculate effective number of atoms of FCC structure mention some materials which have the FCC structure.
   - 2.4 Draw the structure, calculate effective number of atoms of HCP structure mention some materials which have the HCP structure.
   - 2.5 Explain the process of crystallisation of metals and discuss the process of grain formation, dendritic growth and grain boundaries
   - 2.6 Explain factors effecting grain size.
   - 2.7 Explain the process of recrystallisation
   - 2.8 Explain the role of etching solutions in enhancing the contrast of micro structural features.
3. **Production of iron and steel**
   - 3.1 Name the raw materials used in production of Iron and steel
   - 3.2 Describe the production of Pig Iron by Blast Furnace.
   - 3.3 Describe the production of Wrought Iron by puddling furnace.
   - 3.4 Comprehend the production of Cast Iron from Cupola furnace.
   - 3.5 Illustrate the production of steel by Bessemer process.
   - 3.6 Describe the production of steel by L.D. Process.
   - 3.7 Know the production of steel by Open Hearth process.
   - 3.8 Comprehend the production of steel by Electric Arc process.
   - 3.9 Describe the production of steel by Electrical Induction process.
   - 3.10 Define continuous casting (concasting) and its significance in steel production

4. **Iron -carbon equilibrium diagram**.
   - 4.1 State Gibbs phase rule and define the terms involved.
   - 4.2 Know the importance of alloy and its advantages
   - 4.3 Grasp the concept of solid solution
   - 4.4 Discus Interstitial and substitution solid solutions
   - 4.5 Describe chemical compound, and mechanical mixture.
   - 4.6 Sketch Cooling curves of pure metals
   - 4.7 Discuss allotropic forms of pure iron and identify the critical points
   - 4.8 Explain the following micro constituents of Iron & Carbon alloy: ferrite, austenite, cementite, ledeburite, pearlite, steel, eutectoid steel, hypo eutectoid steel and hyper eutectoid steel.
   - 4.9 Sketch Iron- Carbon equilibrium diagram and understand salient points on it.
   - 4.10 Describe peristaltic, eutectic, eutectoid reactions.

5. **Heat treatment of steel.**
   - 5.1 Importance of heat treatment.
   - 5.2 know the stages in heat treatment
   - 5.3 Define critical rate of cooling, martensite, bainite, sorbite and troostite
   - 5.4 Draw TTT curves (isothermal transformations) and interpret it.
   - 5.5 Sketch austenite decomposition on continuous cooling transformation (CCT) diagram.
   - 5.6 Explain Annealing heat treatment process
   - 5.7 Compare full Annealing, Sub critical annealing, spheroidise annealing and isothermal annealing
   - 5.8 Describe Normalizing process and its importance
   - 5.9 Describe hardening process and its importance
   - 5.10 Describe Tempering process and its importance.
   - 5.11 Explain the processes Austempering and Martempering
   - 5.12 Define Surface hardening and Case hardening.
   - 5.13 Define the concept of a vacuum furnace and its operating principle.

6. **Ferrous metals and alloys & Nonferrous metals and alloys & powder metallurgy**.
   - 6.1 Discuss the effect of carbon on properties of cast iron
   - 6.2 List different types of cast irons
   - 6.3 Compare the composition and applications of white cast iron, Gray cast iron, nodular iron and malleable Iron
   - 6.4 Classify the plain carbon steels
   - 6.5 Discus the effect of carbon on properties of steel
   - 6.6 Describe the effect of adding alloying elements chromium, cobalt, manganese, molybdenum, nickel, tungsten, vanadium to steel
   - 6.7 Define ternary, quaternary and complex alloy steel
   - 6.8 Explain the composition, properties and application of chromium steel, HSS steel, nickel steel, manganese steel and stainless steel.
   - 6.9 List composition, properties and application of duralumin, dow metal
   - 6.10 Give composition, properties and application of brass, cartridge brass, admiralty brass, muntz metal, and naval brass.

6.11 Explain the importance of Bronze, gun metal and bell metal
6.12 Discuss the composition and application of Nickel alloys: constantan, Monel, Nichrome and invar.
6.13 Write composition and application of Babbit metal
6.14 Define Powder metallurgy
6.15 Describe the manufacturing process in powder metallurgy.
6.16 Write the processes to produce metal powders.
6.17 List the methods to compact powders
6.18 Define Pre sintering and sintering.
6.19 Define reaction sintering and differentiate it from conventional sintering processes.
6.20 Write advantages and limitations of powder metallurgy.
6.21 Applications of powder metallurgy.

SUGGESTED STUDENT ACTIVITIES:

1. Make a list of commonly used materials in daily life like blade, knife, scissors etc and write the material used.
2. Examine the microstructure of the provided specimen.
3. Examine micro structure of given specimen after it is welded and notice the difference.
4. Visit to a steel plant
5. Compare hardness of commonly available materials and interpret.
6. Make a list of major parts of a two-wheeler and know the material used.
7. Visit a heat treatment plant.

SUGGESTED E-RESOURCES:

1. Crystal lattice and unit cell
   https://www.youtube.com/watch?v=BjVTdZ_htu8
2. BCC, FCC and HCP crystal structure
   https://www.youtube.com/watch?v=tq7botEnakA
3. Production of pig iron by blast furnace
   https://www.youtube.com/watch?v=D3ejDgChEhw
4. Production of Wrought Iron by Puddling furnace
   https://www.youtube.com/watch?v=XJ0GyofGchI
5. Production ofCast Iron from Cupola
   https://www.youtube.com/watch?v=Cgbpbw5GRK4
6. Production ofSteel by Bessemer Process
   https://www.youtube.com/watch?v=uh_RAMqRgrk
7. Production ofSteel by Open Hearth Process
   https://www.youtube.com/watch?v=LxH-B1efDnI
8. Production ofSteel by electric arc furnace
   https://www.youtube.com/watch?v=7oSbZgjXlFo
9. Production ofSteel by electrical induction process
   https://www.youtube.com/watch?v=5TLBdBXzMsg

COURSE OUT COMES		CL	LINKED PO'S	TEACHING PERIODS
CO1	Classify the properties of engineering materials and know the testing methods to analyse the mechanical properties"	R, U, A	1,2,3.4	12
CO2	Grasp the significance and basic principles underlying the structure of materials.	R, U, A	1,3,4,7	13
CO3	Comprehend the methods involved in the production of iron and steel through different processes.	R, U, A	1,2,4,5	12
CO4	Apply knowledge of the Iron-Carbon equilibrium diagram to interpret the various microstructures present in iron and steel.	R, U, A	1,2,4,7	13
CO5	Utilize knowledge of heat treatment processes to distinguish between different methods used in treating steel.	R, U, A	1,2,4,7	13
CO6	Break down the properties and characteristics of various ferrous and nonferrous metals and alloys and understand their suitability for different purposes.	R, U, A	1,2,3,5	12
			TOTAL PERIODS	75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO ATTAINMENT MATRIX

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	2	-	1	-	-	-	PO1, PO2, PO4
CO2	3	1	-	-	-	-	-	PO1, PO2
CO3	3	-	2	-	-	-	-	PO1, PO3
CO4	3	1	-	-	-	-	-	PO1, PO2
CO5	3	1	-	1	-	-	-	PO1, PO2, PO4
CO6	3	2	1	-	-	-	-	PO1, PO2, PO3

Level-3-highly addressed, Level-2-moderately addressed, Level-1-Lowely addressed

MODEL PAPER

MID SEM I EXAMINATION

DME III SEMESTER

ENGINEERING MATERIALS

Time: 1 hr **Total Marks: 20**

PART – A **Marks: 4 X 1 M = 4 M**

NOTE: 1) Answer all questions and each question carries one marks.

2) Answers should be brief and straight to the point and shall not exceed three simple sentences

1. Define the term strength
2. Define the term creep
3. What is meant by unit cell?
4. Draw the shape of dendrite.

PART – B Marks : 2 X 3 M= 6 M

NOTE: 1) Answer all questions and each question carries three marks

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

5 (a) Write the importance of engineering materials in industry.

OR

5 (b) Write any three differences between Izod and Charpy impact test .

6 (a) Describe factors affecting the grain size.

OR

6 (b) Calculate effective numbers of atoms in FCC structure.

PART – C

Marks: 2 X 05 M= 10 M

NOTE: 1)Answer all questions and each question carries five marks

2)The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

7 (a) Explain the procedure to conduct the tensile test on mild steel by UTM

OR

7(b) Explain about Vickers hardness test

8 (a) Explain BCC structure with the help of sketch.

OR

8 (b) Explain the process of recrystallisation.

ME-305

MODEL PAPER

MID SEM II EXAMINATION

DME III SEMESTER

ENGINEERING MATERIALS

Time: 1 hr **Total Marks: 20**

PART – A **Marks: 4 X 1 M = 4 M**

NOTE: 1) Answer all questions and each question carries one marks.

2) Answers should be brief and straight to the point and shall not exceed three simple sentences

1. What are the different raw materials for production of iron?
2. Name the type of iron produced by puddling furnace.
3. Define alloy.
4. What is a solid solution?

PART – B Marks: 2 X 3 M= 6 M

NOTE: 1) Answer all questions and each question carries three marks
2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

5 (a) List two types of electric furnaces.

OR

5 (b) Write the principle of steel making.

6 (a) Define interstitial solid solution and substitutional solid solution.

OR

6 (b) Write short note on eutectoid steel.

PART – C

Marks: 2 X 05 M= 10 M

NOTE: 1)Answer all questions and each question carries five marks
2)The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

7(a) Explain about steel production by L-D Process.

OR

7(b) Explain production of wrought iron by puddling furnace.

8 (a) Discuss allotropic forms of pure iron and identify the critical points.

OR

8(b) Explain peritectic, eutectic, and eutectoid reactions in iron carbon equilibrium.

ME-305 - SEE- MODEL PAPER BOARD DIPLOMA EXAMINATION
DME III SEMESTER
ENGINEERING MATERIALS

TIME: 2 Hours **Max. Marks: 40**

PART – A **Marks: 8 X 1 M = 8M**

NOTE:1) Answer all questions and each question carries one mark.

2) Answers should be brief and straight to the point and shall not exceeding three simple sentences

1. Define the term malleability.
2. What are the by-products of blast furnace?
3. What is meant by non-ferrous metal?
4. Define shear strength.
5. Define the term heat treatment.
6. Name any two annealing processes.
7. What is steel?
8. What is meant by sintering?

PART – B

Answer all questions . Each question carries three marks

4 x 3 M = 12M

9 (a) Write short notes on a) creep b) fatigue.

OR

9 (b) What are the three stages of heat treatment of steel?

10 (a) Write the function of coke and lime stone in production of iron.

OR

10 (b) Write the composition of High speed steel. And its applications.

11(a) Write about tempering process and its importance.

OR

11 (b) Explain sub critical annealing.

12 (a) Classify plain carbon steels.

OR

12 (b) what are the advantages of powder metallurgy?

PART – C

Answer all questions . Each question carries five marks 4 x 5
M = 20 M

13 (a) Explain BCC structure with sketch and name the materials which have the BCC structure.

OR

13 (b) Explain normalising process.

14 (a) Explain production of cast iron by cupola furnace.

OR

14 (b) Write short notes on below two methods of manufacture of metal powders

i) Mechanical pulverisation ii) atomisation

15 (a) Explain continuous cooling transformation (CCT) curves.

OR

15 (b) Explain hardening processes.

16 (a) Write composition, properties and application of Babbitt metal.

OR

16 (b) Explain briefly the sequence of operation in producing a part by powder metallurgy.

ME-306 ADDITIVE AND ADVANCED MANUFACTURING PROCESS

Course Title:	**Additive and Advanced Manufacturing Process**	Course Code	**ME-306**
Semester	**III Semester**	Course Group	**Core**
Teaching Scheme in Periods (L:T:P)	**4:1:0**	Credits	**2.5**
Methodology	**Lecture+Tutorials**	Total Contact Periods	**75**
CIE	**60 Marks**	SEE	**40 Marks**

Pre requisites

Basic knowledge of Manufacturing Processes and CAD software.

Course Outcomes

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

CO1	Explain different working principles of additive manufacturing processes and understand the basic concept of Vat photo polymerization AM Process.
CO2	Explore the Basic principle and working of fused deposition modeling (FDM) 3D Printing process
CO3	Explain the Powder Fusion Mechanism and various processes.
CO4	Apply suitable CAD tools and CAD interface for additive manufacturing process
CO5	Appreciate the role of post-processing techniques and Explore the Applications of Additive Manufacturing in various fields
CO6	Explain Modern machining process for different applications.

Course Content and Blue Print of Marks for SEE

Unit No	**Unit Name**	**Periods**	**Questions to be set for SEE**			
			R		**U**	**A**
I	Introduction to Additive Manufacturing& Vat Photo polymerization AM Processes	15	Q4	Q1	Q9(a)	Q13(a)
II	Extrusion-Based AM Processes	10				
III	Powder Bed Fusion AM Processes	15		Q2	Q10(a)	Q14(a)
IV	CAD Modelling for 3D printing	10				
V	Post processing and Applications for Additive Manufacturing	12		Q3 Q5,Q6	Q9(b),Q11(a), Q11(b)	Q13(b),Q15(a), Q15(b)
VI	Modern Machining Process	13		Q7,Q8	Q10(b),Q12(a), Q12(b)	Q14(b),Q16(a), Q16(b)
	Total	**75**	**8**		**8**	**8**

Course Contents

UNIT - 1: Introduction to Additive Manufacturing &Vat Photo polymerization AM Processes

Duration: 15 Periods (L: 13 – T: 2)

Introduction to Additive Manufacturing, Use of AM Parts, Process chain or Steps in AM, Benefits of AM, Limitations of AM, Distinction between CNC machining and AM, Types of materials for AM, and Classification of additive manufacturing processes. Concepts of additive manufacturing technologies.

Vat Photo polymerization AM Processes: Stereo lithography (SL), Materials, Process Modeling, Process Benefits and Drawbacks, Applications of Vat Photo polymerization.

UNIT - 2:Extrusion-Based AM Processes

Duration: 10 Periods(L: 8 – T: 2)

Extrusion Based AM Processes-Introduction, Principles, Materials, Plotting and path control, Fused Deposition Modeling (FDM),Bio-Extrusion, Contour Crafting, FDM of Ceramics, Advantages and Limitations of FDM, Applications of Extrusion-Based Processes.

UNIT - 3: Powder Bed Fusion AM Processes

Duration: 15 Periods(L: 12 – T: 3)

Selective laser Sintering (SLS), Materials, Powder fusion mechanism and powder handling, Process Parameters, Electron Beam melting (EBM), Process Benefits and Drawbacks, Applications of Powder Bed Fusion Processes, Case Studies.

UNIT - 4: CAD Modeling for 3D printing

Duration: 10 Periods(L: 8 – T: 2)

CAD Modeling for 3D printing-3D Scanning and digitization, data handling &reduction Methods, AM Software: data formats and standardization, Slicing algorithms: -uniform flat layer slicing, adaptive slicing, Process-path generation: Process-path algorithms, rasterisation, part Orientation and support generation.

UNIT - 5:Post processing and Applications for Additive Manufacturing

Duration: 12 Periods(L: 10 – T: 2)

Post Processing- Introduction, Support Material Removal, Surface Texture Improvement, Accuracy Improvement, Aesthetic Improvement, Preparation for use as a Pattern, Property Enhancements using Non-thermal and Thermal Techniques.Applications for Additive Manufacturing- Aerospace and Automotive application, Use of AM to support Medical Applications, Tissue Engineering, Biomedical Application, Art, Fashion, Jewelry, Toys & Other Applications.

UNIT - 6: Modern Machining Process

Duration: 13 Periods(L: 11 – T: 2)

Introduction – comparison with traditional machining; Ultrasonic Machining: principle, Description of equipment, applications - Electric Discharge Machining: Principle, Description of equipment, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, applications - Wire cut EDM: Principle, Description of equipment, Controlling parameters; applications - Abrasive Jet Machining: principle, description of equipment, application - Laser Beam Machining: principle, description of equipment, application - Electro Chemical Machining: description of equipment, application.

Text Books

1. Ian Gibson, David W Rosen, Brent Stucker., “Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing.”
2. Chua Chee Kai, Leong Kah Fai, “3D Printing and Additive Manufacturing: Principles & Applications.”
3. Additive Manufacturing, Second Edition, Amit Bandyopadhyay Susmita Bose, CRC Press Taylor & Francis Group, 2020.
4. Additive Manufacturing: Principles, Technologies and Applications, C.P Paul, A.N Junoop, McGrawHill, 2021.
5. D.T. Pham, S.S. Dimov, Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling.
6. Patri K. Venuvinod and Weiyin Ma, “Rapid Prototyping: Laser-based and Other Technologies.”
7. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons.
8. Manufacturing Technology - P N Rao
9. Production Technology - R.C.Patel
10. Production Technology - Jain & Gupta

Suggested e-Learning Links

1. https://www.nist.gov/additive-manufacturing
2. https://www.metal-am.com/
3. http://additivemanufacturing.com/basics/
4. https://www.3dprintingindustry.com/
5. https://www.thingiverse.com/
6. https://reprap.org/wiki/RepRap

Suggested Learning Outcomes

For achieving the Course outcomes, the following learning outcomes must be achieved

CO-1: Explain different working principles of additive manufacturing processes and understand the basic concept of Vat photo polymerization AM Process.

1.1 Understand the fundamental concepts and principles of additive manufacturing (AM).
1.2 Explain the process chain or steps involved in additive manufacturing, from design to final part production.
1.3 Identify the benefits of additive manufacturing compared to traditional manufacturing methods.
1.4 Recognize the limitations and challenges associated with additive manufacturing processes.
1.5 Understand the distinction between AM and CNC Machining.
1.6 Describe the types of materials used in additive manufacturing.
1.7 Classify additive manufacturing processes based on their working principles and techniques.
1.8 Explain the working principle of Vat photo polymerization AM processes, with a focus on Stereo lithography (SL).
1.9 Identify the materials commonly used in Vat photo polymerization AM processes.
1.10 Understand the process modeling techniques used in Vat photo polymerization AM processes.
1.11 Evaluate the benefits and drawbacks of Vat photo polymerization AM processes.
1.12 Explore the applications of Vat photo polymerization AM processes in various industries, such as prototyping, healthcare, and aerospace.

CO-2: Explore the Basic principle and working of fused deposition modeling (FDM) 3D Printing process

2.1 Appreciate the impact of extrusion-based AM on manufacturing and product development, Understand the fundamental principles of extrusion-based additive manufacturing (AM) processes.
2.2 Explain the basic principles underlying extrusion-based AM, including layer-by-layer deposition and controlled material extrusion.
2.3 Understand the role of support structures and their significance in achieving successful prints.
2.4 Describe the different types of materials used in extrusion-based AM, including thermoplastics, biomaterials, and ceramics.
2.5 Understand the principles of plotting and path control in extrusion-based AM systems.
2.6 Describe the Fused Deposition Modeling (FDM) process, including the equipment setup, material extrusion, and layer-by-layer deposition.
2.7 Identify the advantages, limitations, and considerations specific to FDM technology in additive manufacturing applications.
2.8 Define bio-extrusion or bioprinting and its application in tissue engineering, regenerative medicine.
2.9 Explain the principles and advantages of contour crafting in construction and large-scale manufacturing.
2.10 Describe the process of FDM of ceramics
2.11 Identify and describe common limitations and challenges associated with FDM technology
2.12 Explore a range of applications for extrusion-based AM processes across industries, including prototyping, custom manufacturing, and education.

CO-3: Explain the Powder Fusion Mechanism and various processes.

3.1 Understand the working principles and operation of Selective Laser Sintering (SLS) technology in additive manufacturing.

3.2 Explore the range of materials suitable for SLS, including polymers, metals, and ceramics.

3.3 Explain the powder fusion mechanism in SLS processes and the importance of proper powder handling techniques.

3.4 Describe the key process parameters in SLS, such as laser power, scanning speed, and layer thickness.

3.5 Describe the principles of electron beam melting (EBM)

3.6 Understand the working principles and differences between Selective Laser Sintering (SLS) and Electron Beam Melting (EBM) technologies.

3.7 Identify the unique advantages and limitations of EBM compared to other powder bed fusion processes.

3.8 Analyze the benefits and drawbacks of powder bed fusion processes

3.9 Explore a wide range of applications for powder bed fusion processes in industries such as aerospace, healthcare, and consumer goods.

3.10 Analyze case studies and examples of successful applications, including prototyping, tooling, and end-use production.

CO-4: Apply suitable CAD tools and CAD interface for additive manufacturing process

4.1 Learn various methods for capturing and converting physical objects into digital 3D models.

4.2 Understand the principles and techniques of 3D scanning and digitization.

4.3 Identify common data formats used in additive manufacturing (AM) software and understand their characteristics and compatibility.

4.4 Understand the principles behind slicing algorithms used in additive manufacturing.

4.5 Explore different slicing techniques, including uniform flat layer slicing, adaptive slicing, and rasterization.

4.6 Understand the principles of process-path generation and its importance in additive manufacturing.

4.7 Implement process-path algorithms to generate tool paths for additive manufacturing machines.

4.8 Analyze rasterization techniques and their impact on print quality and efficiency..

4.9 Evaluate the importance of part orientation in achieving optimal print results.

4.10 Utilize software tools to determine the best orientation for printing based on factors such as support requirements and surface finish.

CO-5: Appreciate the role of post-processing techniques and Explore the Applications of Additive Manufacturing in various fields

5.1 Identify the different types of post-processing techniques and their applications in enhancing AM parts.
5.2 Understand the importance of proper support removal in achieving desired surface finish and dimensional accuracy.
5.3 Implement techniques to improve the surface finish of 3D printed parts.
5.4 Identify common sources of dimensional inaccuracies in 3D printed parts and implement post-processing techniques to improve dimensional accuracy, such as machining.
5.5 Enhance the visual appearance of 3D printed parts through painting, coloring, or surface treatments to meet aesthetic requirements.
5.6 Recognize the requirements for using 3D printed parts as patterns for casting and molding processes.
5.7 Explore non-thermal techniques, and thermal techniques to enhance part strength, durability, or thermal stability.
5.8 Identify specific applications of additive manufacturing in the aerospace and automotive industries, such as rapid prototyping, tooling, and lightweight component production.
5.9 Explore the use of additive manufacturing to support medical applications, including surgical and diagnostic aids, prosthetics development, and manufacturing of medically related products.
5.10 Describe the role of additive manufacturing in tissue engineering and regenerative medicine, including the fabrication of scaffolds, and bio-printed tissues.
5.11 Explore the creative applications of AM in art, fashion, jewelry, and toy industries.

CO-6: Explain Modern machining process for different applications.

6.1 Compare modern machining process with traditional machining.
6.2 Understand the principle, construction of Ultrasonic Machine and its applications.
6.3 Understand the principle of Electric Discharge Machining, Description of equipment
6.4 State the necessity of Dielectric fluid.
6.5 Identify the function of electrodes and its materials.
6.6 Give Process parameters, Output characteristics, of electrodes.
6.7 Understand the principle of Wire cut EDM, Description of equipment, controlling parameters and give applications.
6.8 Understand the principle of Abrasive Jet Machining description of equipment, and give application.
6.9 Understand the principle of Laser Beam Machining, description of equipment, and give application.
6.10 Understand the principle of Electro Chemical Machining, description of equipment, and give application

Suggested Student Activities

1) Provide students with case studies of real-world additive manufacturing projects in different industries (e.g., aerospace, medical, consumer goods).
2) Allow students to operate 3D printers and familiarize themselves with the printing process. Have them load filaments, set printing parameters, and monitor the printing progress. This hands-on experience will deepen their understanding of additive manufacturing technology.
3) Organize CAD modeling challenges where students are given specific design requirements (e.g., weight reduction, assembly constraints) and must create 3D models that meet those criteria. This activity will enhance their CAD modeling skills and creativity.
4) Have students research and compare different materials commonly used in additive manufacturing (e.g., thermoplastics, metals, ceramics). Then, ask them to select the most suitable material for specific applications based on material properties, cost, and performance requirements.
5) Assign group projects where students collaborate to solve a complex problem using additive manufacturing. Examples could include creating a functional tool or gadget, or developing a custom medical device. This activity promotes teamwork, problem-solving, and project management skills.
6) Invite professionals from additive manufacturing companies or experts in specific application areas (e.g., aerospace engineers, biomedical researchers) to give guest lectures or organize field trips to additive manufacturing facilities. This exposes students to real-world applications and industry practices.
7) Assign research topics related to additive manufacturing advancements, emerging technologies, or challenges facing the industry.
8) Use additive manufacturing simulation software to simulate different printing scenarios and evaluate their outcomes. Students can adjust printing parameters, analyze results, and optimize the printing process to achieve desired outcomes. This activity reinforces theoretical concepts and problem-solving skills.

CO-PO Mapping Matrix

	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	
CO1	3	1	-	-	1	-	-	1,2,5
CO2	2	1	-	-	1	-	-	1,2,5
CO3	2	-	2	2	-	-	-	1,3,4
CO4	3	2	-	-	-	2	-	1,2,6
CO5	3	-	-	-	2	-	2	1,5,7
CO6	2	3	-	2	1	1	2	1,2,4,5,6,7

State Board of Technical Education and Training, Telangana
Model Question paper
Additive and Advanced Manufacturing ProcessIV-SEMESTER
Mid Semester-I Examination

Course Code: ME-306 **Duration:1 hour**
Course Name: Additive and Advanced Manufacturing Process
Max. Marks: 20 Marks

PART-A

Answer **all** questions- Each Question carries **ONE**-mark **4x1 = 4 Marks**

1. Define additive manufacturing(AM).
2. What is one limitation of additive manufacturing?
3. Name one common material used in extrusion-based additive manufacturing.
4. Which material is commonly used in FDM of ceramics?

PART-B

Answer **two** questions- Each Question carries **THREE** marks **2x3 = 6 Marks**

5. a)List three benefits of using additive manufacturing over traditional manufacturing methods.

(OR)

b)Name three types of materials commonly used in additive manufacturing processes and give an example of each.

6. a)Write three advantages and three limitations of FDM in additive manufacturing.

(OR)

b)What is Bio-Extrusion process?

PART-C

Answer **two** questions- Each Question carries **FIVE** marks **2x5 = 10 Marks**

7. a) Explain stereo lithography process with a neat diagram.

(OR)

b)List and explain process chain (stages) of additive manufacturing.

8. a)Describe the FDM process, including the heating, extrusion, and deposition stages?

(OR)

b)What is plotting and path control in the context of Extrusion Based AM?

State Board of Technical Education and Training, Telangana
Model Question paper
Additive and Advanced Manufacturing ProcessIV-SEMESTER
Mid Semester-II Examination

Course Code: ME-306 **Duration:1 hour**
Course Name: Additive and Advanced Manufacturing Process
Max.Marks: 20 Marks

PART-A

Answer **all** questions- Each Question carries **ONE** mark **4x1 = 4 Marks**

1. What does SLS stand for in the context of additive manufacturing?
2. Which energy source is typically used in Electron Beam Melting (EBM)?
3. Name one common data format used for storing 3D model information.
4. Define rasterization.

PART-B

Answer **two** questions- Each Question carries **THREE** marks **2x3 = 6 Marks**

5. a) What are three essential process parameters that influence the quality of parts fabricated through powder bed fusion processes?

(OR)

b) List three benefits and three drawbacks of using powder bed fusion processes in additive manufacturing.

6. a) Explain the difference between uniform flat layer slicing and adaptive slicing techniques in additive manufacturing.

(OR)

b) What is the importance of part orientation in additive manufacturing?

PART-C

Answer **two** questions- Each Question carries **FIVE** marks **2x5 = 10 Marks**

7. a) Define powder bed fusion processes. Discuss the solid-state sintering mechanism.

(OR)

b)Write the differences between Selective Laser Sintering (SLS) and Electron Beam Melting (EBM).

8. a) Describe the process of capturing and converting physical objects into digital 3D models, mentioning various methods involved.

(OR)

b) Explain the process-path generation in additive manufacturing, highlighting the role of rasterization.

State Board of Technical Education and Training, Telangana
Model Question paper
Additive and Advanced Manufacturing ProcessIV-SEMESTER
Semester End Examination

Course Code: ME-306 **Duration:2 hour**
Course Name: Additive and Advanced Manufacturing Process
Max.Marks: 40 Marks

PART-A

Answer **all** questions- Each Question carries **ONE** mark **8x1 = 8 Marks**

1. Briefly define contour crafting.
2. What does EBM stand for in additive manufacturing?
3.What is the primary principle of Abrasive Jet Machining?
4. Name one application of bio-extrusion in additive manufacturing.
5. Name one method to enhance the visual appearance of 3D printed parts for aesthetic requirements.
6. Identify one common source of dimensional inaccuracies in 3D printed parts.
7. What is a dielectric fluid.
8. Name the material used for electrode in EDM

PART-B

Answer **Four** questions- Each Question carries **THREE** marks **4x3 = 12 Marks**

9. a)Discuss the materials commonly used in extrusion-based AM processes

(OR)

b)Explain the difference between non-thermal and thermal techniques.

10. a) Identify and describe common data formats used in additive manufacturing (AM) software

(OR)

b) Write the advantages of Modern machining process.

11. a) Why is post-processing important?

(OR)

b) Discuss the role of additive manufacturing in supporting medical applications.

12. a) List the functions of a electrode in modern machining process.

(OR)

b) List various electrode materials.

PART-C

Answer **Four** questions- Each Question carries **FIVE** marks **4x5 = 20 Marks**

13. a)Define additive manufacturing process. List out the advantages of AM process in detail.

(OR)

b) Explain in brief the applications of AM systems in various industries with examples.

14. a) Explain with a neat sketch the working principle of Selective Laser Sintering process.

(OR)

b) Explain AJM.

15. a)List out the post processing technique of additive manufacturing parts. Explain any three techniques?

(OR)

b)Discuss the importance of aesthetic enhancements in additive manufacturing and provide examples of techniques used to achieve them.

16. a)Explain Electro Chemical Machining.

(OR)

b)Explain Ultrasonic machining.

ME-307 MACHINE DRAWING

Course title	Machine Drawing	Course Code	ME-307
Semester	III	Course group	Practical
Teaching scheme in periods (L:T:P)	1:0:2	Credits	1.25
Methodology	Lecturer + Practice	Total contact periods	45
CIE	60 Marks	SEE	40 Marks

PRE REQUISITES: This course requires the knowledge of Engineering Drawing

COURSE OUTCOMES: On successful completion of the course, the students will be able to

CO1	Outline the machine drawing.
CO2	Select the need and application of different types of fasteners and draw according to specifications, keys and cotter joints welded joints, piping layout and riveted joints as per IS standards.
CO3	Illustrate and draw various Welding symbols
CO4	Show and draw various pipe fittings and layouts
CO5	Proficiency In reading and interpret various drawings of a component and understand the concepts of Assembly drawings

BLUE PRINT OF MARKS FOR SEMESTER END EXAM

Unit No.	**Unit Name**	**Periods**	**Questions for SEE**			**Remarks**
			R	**U**	**A**	
1	Introduction and fastening devices	8		Q.No.1,2		
2	Pipe Layouts and Welding symbols	7		Q.No.3,4		
3	ASSEMBLY-I Assembly drawings of cotter joint, Gib and Cotter joint, Knuckle Joint,Muff coupling, universal coupling, Flange couplings, Screw Jack, Stuffing Box	15			Q.No.5	
4	ASSEMBLY –II Assembly Drawings of Bearings (Foot step Bearing, Plummer block),cross Head, connecting rod, Eccentric, lathe tail stock	15			Q.No.6	
TOTAL		**45**		**4**	**2**	

COURSE CONTENT

1.0 Introduction

Importance of Machine Drawing - Brief revision of 1st and 3rd angle projections - Understand the concepts of Orthographic projections and Sectional views.

Fastening Devices

Temporary and Permanent fastenings and their areas of application-thread nomenclature, forms of screw thread profiles, metric, B.A., Acme, Knuckle, etc.*Bolts and Nuts:* Specification of bolts and nuts, different types of bolted joints (through bolts, studs, screws etc.) in different applications. Purpose of lock nuts and their types *Keys and cotters*: Types of keys and cotters: Difference between key and cotter uses.*Rivets and Riveted joints:* Types and proportions and specification of rivets: Different types of riveted joints: Lap, butt-single row, double row etc., chain and zigzag riveting – calculation of diameter of rivet: Pitch and arrangement of rivets in row – use – of standard proportions.

Welded joints and types. Pipe Joints

Exercises: 1

1. Thread Nomenclature and forms of screw thread profiles.
2. Exercises in drawing – bolted connections using standard proportions.
3. Drawing of various types of lock nuts & types of keys indicating their proportionate dimensions.
4. Exercise in drawing riveted joints using standard proportions: Single row, double row (chain and zigzag) in lap and butt joints (single & double strap).

2.0 Piping layouts

Classification of pipes and tubes- Components of pipes lay-out.-Screw fitting bend, elbow, tee, lateral Cross-nipple, reducing socket and plug - Unions: Screwed ground and flanged - Valves: Gate valve: angle valve, check valve - Various conventional symbol used for the above components.

Exercise: 2

1. Single line diagram of pipe layout one exercises.
2. Double line diagram of pipe layout one exercise.

Welded fabrication drawings

Different types of weld and their basic symbols including sectional representation as per table of I.S. standards, fillet, square butt, single V-Butt, double V-Butt, single bevel butt, double bevel butt, stud, bead (edge or seal) spot, seam. - Elements of welding symbol andtheir standard location the symbol as per IS standards reference code arrow head, weld symbol supplementary symbol dimensions of welds, method of welding process, special reference - Significance of arrow & position of arrow head significance of reference line as per I.S. standards with reference to fillet, V-Butt an stud welds.

Supplementary symbols and special instructions: surface of reference line; as per I.S. standards with reference to fillet, V-Butt an stud welds.- Dimensions of welds: length, location and spacing of welds as per I.S., B.I.S., standards with showing dimensions required on awelding - Need of special reference.

Exercise: 3

1. Drawing tables and figs. Referred in the contents above taking form I.S. standards.
2. Dimensioning a given welding drawings as per I.S., SP-46-1988.
3. Preparing working drawing of welding fabrication from given data.

3.0 Assembly Drawings-I

Need and functions of assembly and detailed drawings - Steps in preparing assembly drawings -. - Exercises in preparing assembly drawings of commonly available engineering components.

Exercise: 4

Draw the views / sectional views of

1. Cotter joint
2. Jib and cotter joint assembly
3. Knuckle joint assembly
4. Assembly of muffs coupling (solid & split) coupling, Flange couplings
5. Screw jack assembly
6. Stuffing box.

4.0 Assembly Drawings-II

With the knowledge gained by the above exercises the students shall be able to draw exercises onbearings,

1. Protective type flanged coupling
2. Piston of petrol engine
3. Cross head
4. Connecting rod
5. Eccentric
6. flexible coupling
7. Lathe tool post
8. Foot step bearing
9. Plummer block
10. Lathe tail stock

REFERENCE BOOKS:

1. T.S.M & S.S.M in respect of Technical Drawing by TTTI, Madras
2. Machine Drawing by A.C. Parkinson.
3. Machine Drawing by Jones & Jones.
4. Machine Drawing by N.D. Bhatt.

SUGGESTED LEARNING OUTCOMES:

On the completion of the course the student should be able to

1.0 Introduction & Fastening devices

1.1 Know and draw Conventional representation of materials and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
1.2 Know the standard specifications of Nuts & Bolts
1.3 Know the various temporary fastening devices
1.4 Know the various permanent fastening devices
1.5 Know difference between Temporary and permanent joints
1.6 Know the standard representation of Internal and external threads of Bolts & Nuts
1.7 Understand the Standard proportions of various threads like V, ACME, Square, Metric , Knuckle etc.,
1.8 Know the standard designation and purpose of Locknut, washer, set screws.
1.9 Know the Applications of Keys, riveted joints
1.10 Understand the Standard proportions of various keys and cotters
1.11 Know the difference between Key & Cotter
1.12 Know different types of riveted joints and draw according to standard specifications

2.0 Piping Layouts and Welded Joints

2.1 Know the conventional symbols of various welded joints
2.2 Know the conventional symbols of various pipe joints.
2.3 Draw the Single line diagram of pipe layout
2.4 Know and draw Double line diagram of pipe layout

3.0 Assembly drawings

3.1 Know the need of assembly drawing

3.2 Know the functions of assembly drawing like manufacturing and functional requirements

3.3 Know the various steps in making assembly drawing like

- Geometrical mapping
- Dimensional mapping and
- Functional matching

3.4 Study functional requirements of each component and their inter relationship

3.5 Study carefully the views of each component in the detail drawing and decide the relative location of each part for the proper functioning of the machine.

3.6 Decide the mating dimensions between two components which are required to be assembled

3.7 Know the use of bill of material and its designation

Course Outcomes		CL	Linked PO	Teaching Periods
CO1	Understand the machine drawing.	U/A	1,4,7	3
CO2	Understand need and application of different types of fasteners and draw according to specifications, keys and cotter joints welded joints, piping layout and riveted joints as per IS standards.	U/A	1,2,3,4,5,7	6
CO3	Understanding and draw various Welding symbols	U/A	1,4,7	3
CO4	Understand various pipe fittings and layouts	A	1,3,4,5,7	3
CO5	Proficiency In reading and interpret various drawings of a component and understand the concepts of Assembly drawings	U/A	1,2,3,4,7	30

CO-PO MAPPING MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	1	-	-	2
CO2	3	1	1	2	1	-	3
CO3	3	-	-	2	-	-	2
CO4	3	-	1	2	1	-	2
CO5	3	1	1	2	-	-	2

BOARD DIPLOMA EXAMINATIONS, (C-24)

CIE- MID SEM-I MODEL PAPER

MID –I MODEL PAPER

ME-307 MACHINE DRAWING

Time: 1 hr **Max.Marks:20**

Instructions: Answer any **four** questions. Each question carries five marks 4 x 5=20

1. Draw the square thread profiles with proportions.
2. Draw the views of a square headed bolt.
3. Draw a hexagonal headed bolt with nut of 25 mm diameter.
4. Draw a double riveted lap joint connecting two plates of 6mm Thick.
5. Draw the symbols of the following welded joints.
    a. Concave fillet weld
    b. Single v-butt weld
    c. Spot weld
    d. Seam weld
    e. Square butt weld
6. Draw the following piping joint symbols(single line)
    a. T
    b. Elbow
    c. Gate valve
    d. Lateral
    e. Union

BOARD DIPLOMA EXAMINATIONS, (C-24)

CIE- MID SEM-I MODEL PAPER

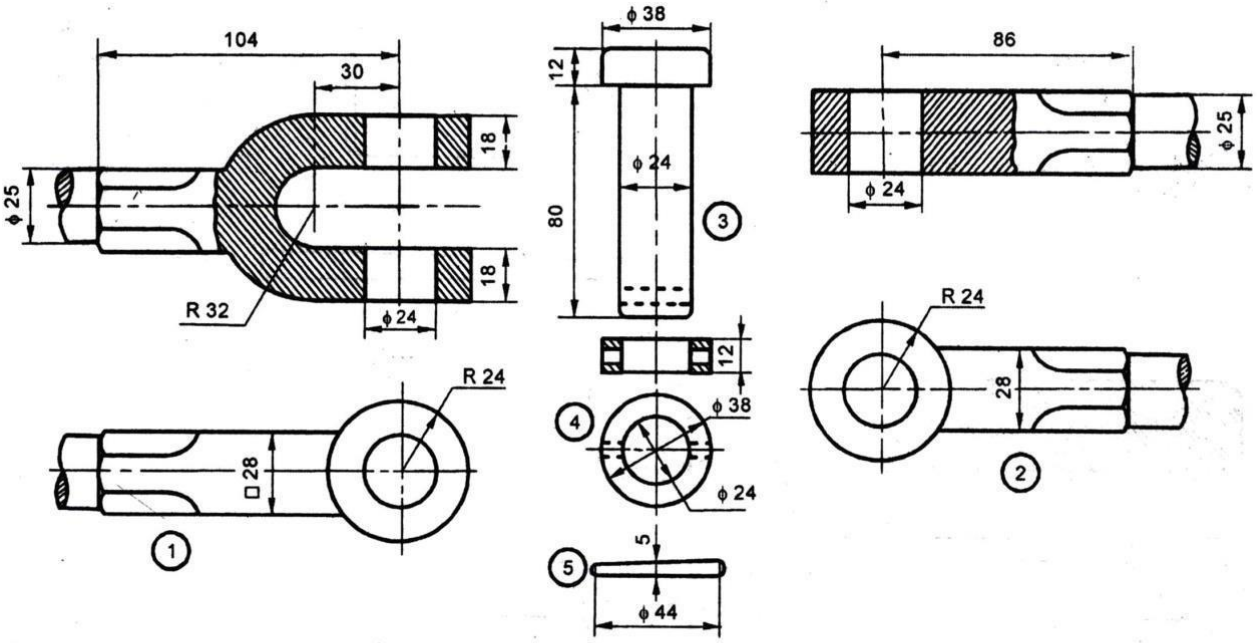
MID –II MODEL PAPER

ME-307 MACHINE DRAWING

Time: 1 hr **Max.Marks:20**

Instructions: Answer any **one** question. Each question carries twenty marks 1 x 20=20

1. Assemble all the parts of the knuckle joint and draw the sectional front view.

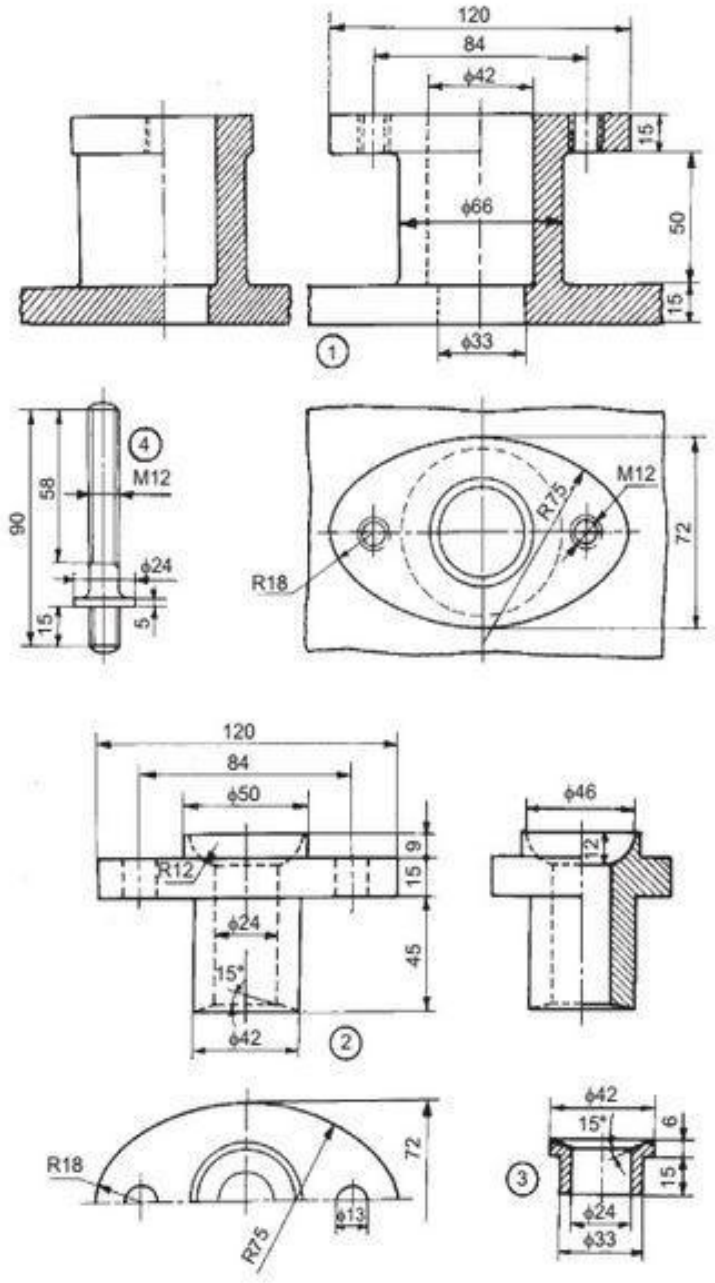


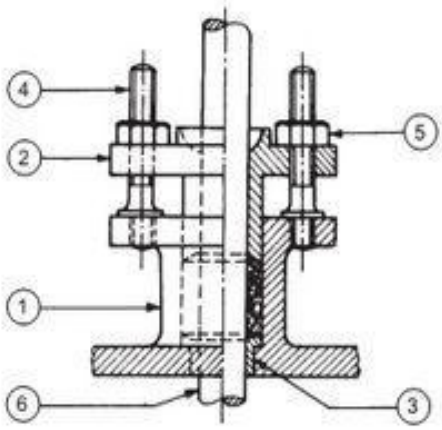
Parts list

No.	Name	Matl	Qty
1	Fork end	F S	1
2	Eye end	F S	1
3	Pin	M S	1
4	Collar	M S	1
5	Taper pin	M S	1

KNUCKLE JOINT

2. Study given part drawing of stuffing box and draw half sectional front view .





Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Gland	Brass	1
3	Bush	Brass	1
4	Stud	MS	2
5	Nut, M12	MS	2

SEMESTER END EXAMINATION MODEL QUESTION PAPER

DME III ME-307 MACHINE DRAWING

Time: 2 hr **Max. Marks: 40**

PART-A 3 X 4 = 12

INSTRUCTIONS: (1) Answer **ALL** questions

(2) Each question carries three marks.

(3) Answer should be neat & clear with all the necessarydimensions.

(4) All dimensions are in 'mm'. Choose suitable scale

1. Draw the following thread profiles with proportions.
   (a) V threads (b) Square thread
2. Draw the views of a hexagonal headed bolt.
3. Draw a single riveted lap joint connecting two plates of 6mm Thick.
4. Draw the symbols of the following welded joints.
   (a) Concave fillet weld (b) Double v-butt weld (c) Spot weld
   (d) Seam Weld (e) Square Butt Weld

PART-B 1 X 28 = 28

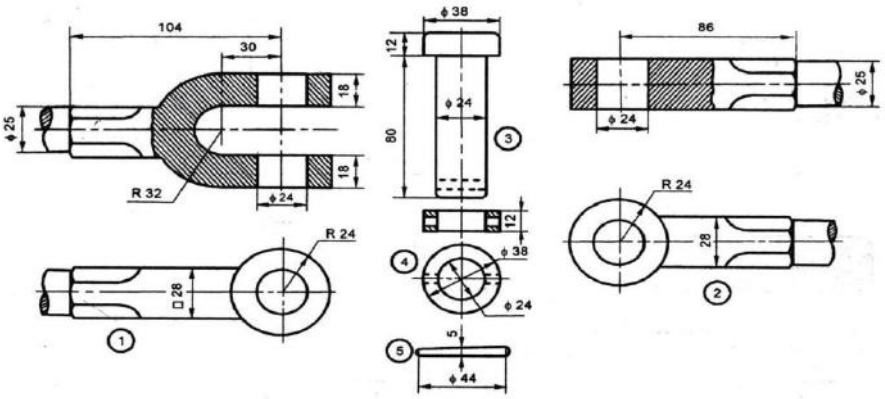
INSTRUCTIONS: (1) Answer any **ONE** question

(2) Each question carries three marks.

(3) Answer should be neat & clear with all the necessarydimensions.

(4) All dimensions are in 'mm'. Choose suitable scale

5. Assemble all the parts of the **knuckle joint** and draw
   a. Sectional front view b. Top view

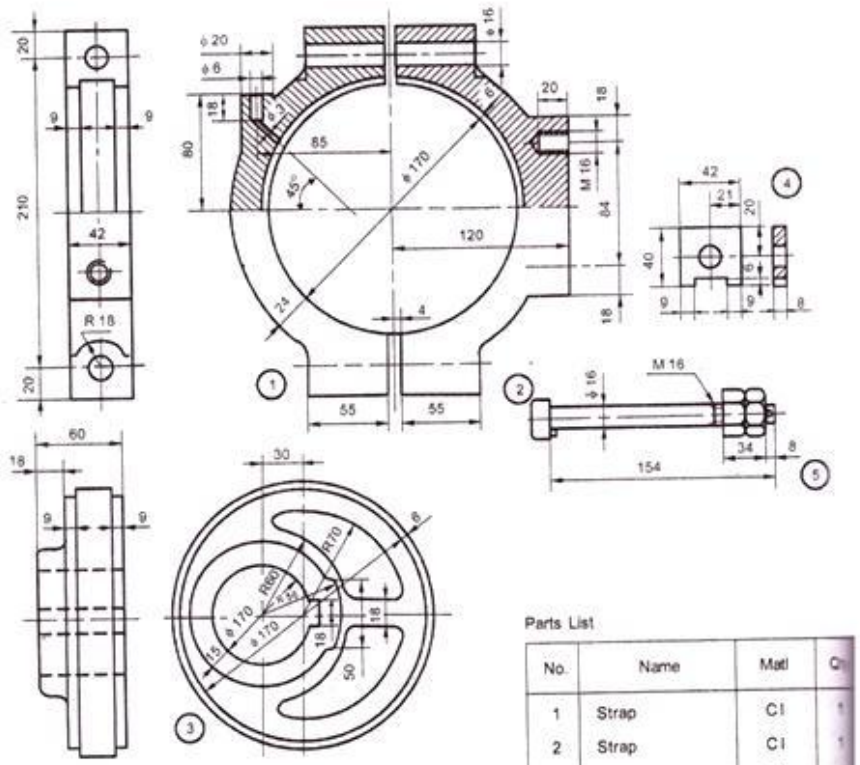


Parts list

No.	Name	Matl	Qty
1	Fork end	F S	1
2	Eye end	F S	1
3	Pin	M S	1
4	Collar	M S	1
5	Taper pin	M S	1

KNUCKLE JOINT

6. Assemble all the parts of the **eccentric** and draw the
   a. Half sectional front view (18 marks)
   b. Right side View (10 marks)



Parts List

No.	Name	Matl	Qty
1	Strap	CI	1
2	Strap	CI	1
3	Sheave	CI	1
4	Shim	BRASS	2
5	Bolts with nuts	M S	2

ME-308-MATERIAL TESTING AND HYDRAULIC MACHINES LAB

Course Title	Material Testing and Hydraulic Machines Lab	Course Code	ME-308
Semester	III	Course Group	Practical
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.25
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60	SEE	40

A. MATERIAL TESTING

PRE REQUISITES: This course requires the basic knowledge of Strength of materials.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to

Course Outcomes		Linked POs	Teaching Periods
CO1	Analyze the various parameters in tensile testing	1,2,3,4,5	03
CO2	Determine the ultimate strength of wood	1,2,3,4,5	03
CO3	Determine the impact strength	1,2,3,4,5	03
CO4	Calculate the hardness number of the given material	1,2,3,4,5	03
CO5	Conduct torsion test on solid shaft and hollow shaft	1,2,3,4,5	03
CO6	Analyze the micro structure of the metals and alloys	1,2,3,4,5	7.5

BLUE PRINT OF MARKS FOR SEE

Unit No	Unit name	Periods	Marks for SEE			Marks weightage	%Weightage
			Handling	Manipulation	Precision		
1.	Tensile test	4	10	10	20	40	100
2.	Compression test	4	10	10	20	40	100
3.	Impact test	4	10	10	20	40	100
4.	Hardness test	4	10	10	20	40	100
5.	Torsion test	3	10	10	20	40	100
6.	Investigation of metal and alloy microstructure	3.5	15	15	10	40	100

COURSE CONTENT:

1. Analyze the various parameters in UTM machine.
2. Determine the ultimate crushing strength of wood. When the load applied perpendicular to grains and load applied along the grains of the wooden block.
3. Determine the impact strength or toughness of material by conducting an impact test on Izod testing machine.
4. Calculate the hardness number of the specimen on Brinell's hardness testing machine.
5. Calculate modulus of rigidity by conducting torsion test on solid shaft and hollow shaft
6. Analyze the micro structure of the metals and alloys

SUGGESTED LEARNING OUTCOMES:

Up on the completion of the course the student shall able to gain the following competencies

Title of the Experiment	Competencies	Key competency
1. Tensile test	A. Fix specimen in the jaws of the machine B. Fit strain gauge to the specimen C. Apply load gradually on the specimen D. Record load, elongation, diameter without error E. Plot graph stress vs strain F. Locate points of elastic limit, yield stress, ultimate stress on the graph	- Record load, elongation, diameter without error - Plot graph stress vs strain - Locate points of elastic limit, yield stress, ultimate stress on the graph
2. Compression test	A. Place the specimen in the machine properly B. Apply load on the specimen C. Record load	- Apply load on the specimen - Record load
3. Impact test	A. Prepare specimen by making V notch at the required height B. Fix specimen on the machine C. Release load to hit the specimen precautious D. Record load	- Release load to hit the specimen precautious - Record load
4. Hardness test	A. Place the specimen on the machine at correct location B. Identify suitable indenter for the specimen C. Make indent on the specimen properly D. Measure diameter of indentation E. Calculate hardness number	- Make indent on the specimen properly - Measure diameter of indentation
5. Torsion test on mild steel bar	A. Measure diameter and length of mild steel bar. B. Take down the value of torque from the indicating dial for particular value of angle of twist. C. Calculate maximum shear stress and shear modulus.	- Measure the diameter of the MS bar with vernier callipers.
6. Investigation of metal and alloy microstructure	A. Prepare specimen B. Handling microscope to observe micro structure C. Plot microstructure	- Handling microscope to observe micro structure - Plot microstructure

CO-PO MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	2	-	2	-	-	-	1,2,4
CO2	2	2	-	2	-	-	-	1,2,4
CO3	2	2	-	2	-	-	-	1,2,4
CO4	2	2	-	2	-	-	-	1,2,4
CO5	2	2	-	2	-	-	-	1,2,4
CO6	2	2	-	3	-	-	-	1,2,4

BOARD DIPLOMA EXANIMATIONS

MID-I Model Question Paper

ME-308-MATERIAL TESTING LAB

Duration: 1 hour **Max.Marks:10**

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Instructions to the Candidate:

(i) Answer any One of the following Questions.
(ii) Record the results on a graph sheet if required and conclude your observation of the experiment
(iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brinell's hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the micro structures of a) Mild Steel b) Pure iron c) Grey cast iron d) Brass e) Aluminum

Note: Mid Exam should be conducted from the experiments in which student undergone training only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS

MID-II Model Question Paper

ME-308-MATERIAL TESTING LAB

Duration: 1 hour **Max.Marks:10**

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Instructions to the Candidate:

(i) Answer any One of the following Questions.
(ii) Record the results on a graph sheet if required and conclude your observation of the experiment
(iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brinell's hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the micro structures of a) Mild Steel b) Pure iron c) Grey cast iron d) Brass e) Aluminum

Note: Mid Exam should be conducted from the experiments in which student undergone training only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS

SEE Model Question Paper

ME-308-MATERIAL TESTING LAB

Duration: 1 hour **Max.Marks:20**

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Instructions to the Candidate:

(i) Answer any One of the following Questions.
(ii) Record the results on a graph sheet if required and conclude your observation ofthe experiment
(iii) Draw the diagram for illustration & choose appropriate values when notmentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brinell's hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the micro structures of a) Mild Steel b) Pure iron c) Grey cast iron d) Brass e) Aluminum

Note: 15 marks for the experiment and 5 marks for viva-voce

B. HYDRAULIC MACHINES LAB

PRE-REQUISITES: This course requires the basic knowledge of Strength of materials.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to

CO1	Calibrate the venturi meter
CO2	Calculate the brake power and efficiency of Pelton turbine
CO3	Calculate the brake power and efficiency of Kaplan turbine.
CO4	Calculate the brake power and efficiency of Francis turbine
CO5	Calculate the efficiency of reciprocating Pump
CO6	Calculate the efficiency of Centrifugal pump

BLUE PRINT OF MARKS FOR SEE

Unit No	**Unit name**	**Hours/ Periods**	**Marks for SEE**			**Marks weightage**	**%Weightage**
			Handling	**Manipulation**	**Precision**		
1	Venturi meter	4	5	7.5	7.5	20	100
2	Pelton wheel	4	5	7.5	7.5	20	100
3	Kaplan turbine	4	5	7.5	7.5	20	100
4	Francis turbine	4	5	7.5	7.5	20	100
5	Reciprocating pump	3	5	7.5	7.5	20	100
6	Centrifugal pump	3.5	5	7.5	7.5	20	100
Total	**22.5**						

COURSE CONTENT:

1. Determination of Coefficient of discharge of Venturi meter.
2. Determination of B.P. and efficiency of Pelton wheel.
3. Determination of B.P. and efficiency of Kaplan turbine.
4. Determination of B.P. and efficiency of Francis turbine.
5. Determination of overall efficiency of a reciprocating pump
6. Determination of overall efficiency of the Centrifugal pump

SUGGESTED LEARNING OUTCOMES:

Up on Completion of the Lab the student shall be able to

1.0 Venturi meter

1.1 State the practical applications of venturi meter.

1.2 Record the manometric head readings from U-tube manometer

1.3 Record the time taken for collecting discharge by varying the discharge

1.3 Calculate the areas of the pipe and throat of the given venturi meter

1.4 Calculate coefficient of discharge of venturi meter.

2.0 Pelton Wheel

2.1 Identify the components of Pelton wheel

2.2 Start turbine by switching on jet of water slowly

2.3 Apply load steadily

2.4 Record load, speed

2.5 Calculate power and efficiency of turbine

3.0 Kaplan Turbine

3.1 Identify the components of Kaplan Turbine

3.2 Start turbine by giving input water supply

3.3 Apply load steadily

3.4 Record load, speed

3.5 Calculate power and efficiency of turbine

4.0 Francis Turbine

4.1 Identify the components of Francis Turbine

4.2 Start turbine by switching on jet of water slowly

4.3 Apply load steadily

4.4 Record load, speed

4.5 Calculate power and efficiency of turbine

5.0 Reciprocating Pump

5.1 Identify the components of reciprocating pump
5.2 Record the suction and delivery pressures from pressure gauges
5.3 Record the time taken for collecting the discharge
5.4 Record the energy meter readings and calculate input power
5.5 Calculate the output power
5.6 Calculate the efficiency

6.0 Centrifugal Pump

6.1 Identify the components of centrifugal pump
6.2 Record the suction and delivery pressures from pressure gauges
6.3 Record the time taken for collecting the discharge
6.4 Record the energy meter readings and calculate input power
6.5 Calculate the output power
6.6 Calculate the efficiency

Key competencies to be acquired by students

Exercise	**Key competency expected**
Calculation of coefficient of discharge of Venturi meter	A. Maintain constant head B. Record readings of U- tube manometer without parallax error C. Record time taken for collection of specific quantity of water D. Calculate discharge and coefficient of discharge of venturi meter E. Repeat experiment for different heads (discharge)
Pelton wheel	A. Start turbine by switching on jet of water slowly B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine A. Plot performance curves
Kaplan Turbine	A. Start turbine by switching on water supply B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine E. Repeat experiment by Varying load/speed; Plot performance curves
Francis Turbine	A. Start turbine by switching on water supply B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine E. Repeat experiment by Varying load/speed; Plot performance curves
ReciprocatingPump	F. Maintain steady flow in suction and delivery pipes G. Record suction and delivery pressure gauge readings H. Record time for collection of specific quantity of water, electrical meter reading (input power) I. Calculate indicated power and efficiency E. Vary the head (flow) and repeat experiment
Centrifugal Pump	A. Maintain steady flow in suction and delivery pipes B. Record suction and delivery pressure gauge readings C. Record time for collection of specific quantity of water, electrical meter reading D. Calculate indicated power and efficiency J. Vary the head (flow) and repeat experiment

CO-PO MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	2	-	2	-	-	-	1,2,4
CO2	2	2	2	2	-	-	-	1,2,3,4
CO3	2	2	2	2	-	-	-	1,2,3,4
CO4	2	2	2	2	-	-	-	1,2,3,4
CO5	2	2	2	2	-	-	-	1,2,3,4
CO6	3	2	-	2	-	-	-	1,2,4

BOARD DIPLOMA EXANIMATIONS

MID-I Model Question Paper

ME-308-Fluid Mechanics & Hydraulic Machines Lab

Duration: 1 hour **Max.Marks:10**

-

Instructions to the Candidate:

(i) Answer any One of the following Questions.
(ii) Record the results on a graph sheet if required and conclude your observation of the experiment
(iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the coefficient of Discharge of Venturi meter.
2. Determine Brake Power and Efficiency of Pelton Turbine
3. Determine Brake Power and Efficiency of Francis Turbine
4. Determine Brake Power and Efficiency of Kaplan Turbine.
5. Calculate the efficiency of Reciprocating Pump.
6. Calculate the efficiency of Centrifugal Pump.

Note: Mid Exam should be conducted from the experiments in which student undergone training only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS
MID-II Model Question Paper
ME-308-Fluid Mechanics & Hydraulic Machines Lab

Duration: 1 hour **Max.Marks:10**

Instructions to the Candidate:

(i) Answer any One of the following Questions.
(ii) Record the results on a graph sheet if required and conclude your observation ofthe experiment
(iii) Draw the diagram for illustration & choose appropriate values when notmentioned in the question

1. Determine the coefficient of Discharge of Venturi meter.
2. Determine Brake Power and Efficiency of Pelton Turbine
3. Determine Brake Power and Efficiency of Francis Turbine
4. Determine Brake Power and Efficiency of Kaplan Turbine.
5. Calculate the efficiency of Reciprocating Pump.
6. Calculate the efficiency of Centrifugal Pump.

Note: Mid Exam should be conducted from the experiments in which student undergonetraining only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS
SEE Model Question Paper
ME-308-Fluid Mechanics & Hydraulic Machines Lab

Duration: 1 hour **Max.Marks:20**

Instructions to the Candidate:

(i) Answer any One of the following Questions.
(ii) Record the results on a graph sheet if required and conclude your observation ofthe experiment
(iii) Draw the diagram for illustration & choose appropriate values when notmentioned in the question

1. Determine the coefficient of Discharge of Venturi meter.
2. Determine Brake Power and Efficiency of Pelton Turbine
3. Determine Brake Power and Efficiency of Francis Turbine
4. Determine Brake Power and Efficiency of Kaplan Turbine.
5. Calculate the efficiency of Reciprocating Pump.
6. Calculate the efficiency of Centrifugal Pump.

Note: 1) 15 marks for the experiment and 5 marks for viva-voice.
2) Student must attend both labs, and if the student fails one of the labs, it is presumed that he fails the lab.

ME-309 ADVANCED MANUFACTURING LAB

Course Title	Advanced Manufacturing Lab	Course Code	**ME-309**
Semester	III	Course Group	Practical
Teaching Scheme in Periods (L: T: P)	15:00:30	Credits	1.25
Methodology	Lecture+Theory + Practice	Total Contact Periods :	45 Periods
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic skills of handling workshop tools; this course also requires the basic knowledge of applied science and mathematics at secondary school level.

Unit No	**Unit name**	**Periods**	**Questions for SEE**			**Marks Weightage**	**% Weightage**
			Handling	Manipulation	Precision		
1	Foundry	10	10	15	15	40	100
2	Machine Shop	15	10	15	15	40	100
3	Welding	10	10	15	15	40	100
4	Machine Shop	10	10	15	15	40	100
	Total	**45**					

Note:

1. Student can answer any one question out of 4 questions.
2. To pass in practical Exam student should acquire 50% marks in both CIE and SEE separately and CIE & SEE put together.
3. If the students acquire less than 50% in CIE, accordingly the students have to acquire more than 50% in SEE to get overall 50 % to pass

On completion of course the student should be able to;

CO1	Ability to prepare sand for moulds and making the moulds ready for casting operation.
CO2	Able to perform certain lathe operations like Plain Turning, Step Turning, Knurling, Facing.Taper Turning
CO3	Understand different equipments, tools and accessories used in welding.
CO4	Basic knowledge in operating welding equipment and performing some welding operations.
CO5	Ability to demonstrate and perform some operations on slotting, shaping machine

COURSE CONTENTS:

FOUNDRY SHOP

Preparation of sand Mould and cutting of Gate, Runner and Riser

1.1 With single piece pattern
1.2 With Split pattern
1.3 With Connecting rod

Lathe shop

2.1 Facing, Plain Turning and knurling
2.2 Facing ,Step Turning

Welding

3.1 Layout of Beads
3.2 Butt joints.

Machine shop

4.1 Produce V-Block on shaping machine
4.2 Key way cutting Slotting Machines

REFERENCE BOOKS:

1.Manufacturing Technology (VolI) by P N Rao (McGraw Hill)
2. Mechanical Workshop & Laboratory Manual By K. C. John

Competencies and Key competencies to be achieved by the student.

Title of the Job	Key Competencies
Moulding and Casting of solid bearing	- Select the suitable sand and its mix for the mould - Place the pattern in correct position - Ram the sand properly - Provide vent holes - Remove the pattern slowly - Cut gates and runners - Pour sufficient quantity of molten metal into the mould cavity
Moulding and Casting of split bearing	- Select the suitable sand and its mix for the mould - Place the pattern in correct position - Ram the sand properly - Provide vent holes - Remove the pattern slowly - Cut gates and runners - Pour sufficient quantity of molten metal into the mould cavity

Title of the Job	Key Competencies
Plain turning	- Check the centering of the work piece using dial gauge - Fix the cutting tool at proper inclination - Select the suitable speed, feed and depth of cut for rough and finishing operations - Check the dimensions
Knurling	- Check the centering of the work piece using dial gauge - Fix the cutting tool at proper inclination to turn the work piece - Select the suitable speed, feed and depth of cut for rough and finishing operations - Check the dimensions - Fix the knurling tool and selecting the suitable speed and feed
Taper turning	- Just an introduction of 4 methods. Student is expected to show how they work on machine. - Hands on exposure to swiveling compound rest method
Welding Layout of beads	- Perform Edge preparation - Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc - Check the bead
Butt joint	- Perform Edge preparation - Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc - Check the bead
Lap joint	- Perform Edge preparation - Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc - Check the bead

V-block on shaping machine.	a. Fix the job on shaping machine table b. Set the tool and give the table feed c. Set the stroke of the ram
Key way cutting by slotting machine	d. Fix the job on slotting machine table e. Set the tool and give the table feed f. Set the stroke of the ram

Course Outcome (CO)		**Cognizant Level**	**Linked Program Outcomes (PO)**	**Teaching periods**
CO1	Identify and use the tools and equipment in foundry Shop	R/U/A	1,2,3,4,7	6
CO2	Acquire skill in basic foundry operations	R/U/A	1,2,3,4,7	6
CO3	Identify and use the tools to perform machining (turning) operations	R/U/A	1,2,3,4,7	11
CO4	Identify and use the tools to perform welding operations	R/U/A	1,2,3,4,7	11
CO5	Identify and use the tools to perform operations in machining (shaping /slotting) operations	R/U/A	1,2,3,4,7	11
R: Remembering, U: Understanding, A: Applying				

CO-PO MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	3	2	2	3	-	-	1	1, 2,3,4,7
CO2	3	3	3	-	-	-	2	1, 2,3,7
CO3	3	3	3	-	-	-	2	1, 2,3,7
CO4	3	3	3	-	-	-	2	1, 2,3,7
CO5	3	2	3	-	-	-	2	1, 2,3,7

ME-309

BOARD DIPLOMA EXAMINATIONS (C-24)

Model Paper

MID SEM - I

Advanced Manufacturing Lab

Time : 2 Hours **Total Marks : 40 MARKS**

Note: Answer any one question.

1. Prepare V Block on shaper.
2. Prepare Key way in a metal block on slotting machine.
3. Prepare mould for given pattern solid bearing.
4. Prepare mould for given pattern split bearing.
5. Prepare mould for given pattern connecting rod
6. Prepare the plain turning as per the given figure.
7. Prepare the step turning as per the given figure.
8. Prepare the taper turning as per the given figure.
9. Prepare Lap joint as per the given figure.
10. Prepare Butt joint as per the given figure.

ME-309

BOARD DIPLOMA EXAMINATIONS (C-24)

Model Paper

MID SEM -II

Advanced Manufacturing Lab

Time : 2 Hours **Total Marks : 40 MARKS**

Note: Answer any one question.

1. Prepare V Block on shaper.
2. Prepare Key way in a metal block on slotting machine.
3. Prepare mould for given pattern solid bearing.
4. Prepare mould for given pattern split bearing.
5. Prepare mould for given pattern connecting rod
6. Prepare the plain turning as per the given figure.
7. Prepare the step turning as per the given figure.
8. Prepare the taper turning as per the given figure.
9. Prepare Lap joint as per the given figure.
10. Prepare Butt joint as per the given figure.

E-309

BOARD DIPLOMA EXAMINATIONS (C-24)

Model Paper

Semester End

Examination

Advanced Manufacturing Lab

Time : 2 Hours **Total Marks : 40 MARKS**

Note: Answer any one question.

1. Prepare V Block on shaper.
2. Prepare Key way in a metal block on slotting machine.
3. Prepare mould for given pattern solid bearing.
4. Prepare mould for given pattern split bearing.
5. Prepare mould for given pattern connecting rod
6. Prepare the plain turning as per the given figure.
7. Prepare the step turning as per the given figure.
8. Prepare the taper turning as per the given figure.
9. Prepare Lap joint as per the given figure.
10. Prepare Butt joint as per the given figure.

HU-310-COMMUNICATION SKILLS AND LIFE SKILLS LAB

CourseTitle	**Communication Skills and Life Skills Lab**	**CourseCode**	**HU-310**
Semester	**III**	**CourseGroup**	**Practical**
TeachingScheme in Periods-L:T:P	**15:0:30**	**Credits**	**1.25**
Methodology	**Lecture +Practical**	**TotalContact Hours**	**45Periods (3Periodsper Week)**
CIE	**60Marks**	**SEE**	**40Marks**

Rationale:

Thecourse isdesigned toimpart listening skillsand lifeskills tothestudents ofdiploma which will help them a great deal inpersonal and professionalfronts.

Prerequisites:

The course requires the basic knowledge of vocabulary, grammar, and four language learning skills, viz. Listening, Speaking, Reading and Writing.

Course Contents

1. **Listening Skills – I**

Duration: 6(L2P4)

- A paragraph
- A song
- A recipe
- A dialogue

2. **Life Skills- I** **Duration: 9(L3P6)**

1. Attitude
    - Features of attitude
    - Attitude and behaviour
    - Attitude formation
    - Positive attitude
    - Negativeattitude
    - Overcoming negative attitude
    - Attitude at workplace
2. Adaptability
    - Needforadaptability
    - Willingnesstoexperiment
    - Fearoffailure
    - Thinkahead
    - Staypositive
    - Curiosity
    - Beinginpresent

3. **Listening Skills- II**

Duration: 6(L2P4)

- Biography
- Interview
- AReport
- TelephoneConversation

4. **Life Skills-II**

Duration: 9(L3P6)

3. Goalsetting
    - Importanceofsettinggoals
    - Whatisgoalsetting
    - Shorttermgoals
    - Longtermgoals
    - Achievegoals usingSMART
4. Creativity
    - Flexibility
    - Curiosity
    - Determination
    - Innovative ideas

5. **Life Skills – III**

Duration: 6(L2P4)

5. Time Management
    - Features of time
    - Secrets of time management
    - Time wasters
    - Prioritization
    - Productive time
    - Time Quadrant

6. Human Values
    - Honesty and integrity
    - Work Ethics
    - Ego and Respect
    - Trust and Truthfulness
    - Social Responsibility
    - Character formation
    - Designing Destiny

6. Life Skills- IV

Duration: 9(L3P6)

7. Problem Solving and Decision Making
    - Define the problem
    - Generate Options
    - Evaluate and choose an option
    - Implement solution
    - Monitoring and Seeking Feedback
8. Leadership Qualities and Team Work
    - SignificanceofLeadership
    - Factorsofleadership
    - Leadershipstyles
    - LeadershipSkills
    - ImportanceofTeamwork
    - Characteristicsofagoodteam
    - Benefitsofteamwork
    - Problems ofteamwork
    - Qualitiesofteamplayer

Course Outcomes

	Attheendofthecoursethestudentswillhavetheability to:
ListeningSkills-I	Comprehend factual information and infer the required details after listening to auditory input and respond to the given context.
ListeningSkills-II	Comprehend factual information and infer the required details after listening to auditory input and respond to the given context.
LifeSkills—I	Develop positive attitude to adapt oneself to all the situations to succeed in professional and personal life.
LifeSkills—II	Set goals using SMART features for life and getinspiredtogetsuccess in professional and personal life. Create innovative things and think out of the box.
LifeSkills—III	Apply varioustimemanagementtechniques and prioritize tasks effectively, and learn to be creative and innovative in thinking.and maintain core human values in personal life and professional life.
LifeSkills—IV	Develop problem-solving skills, make timely decisions, develop trust, confidence, leadership skills and team qualities.

CO-POMatrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	MappingPOs
310.1	-	-	-	-	3	2	3	5,6,7
310.2	-	-	-	-	3	2	3	5,6,7
310.3	-	-	-	-	3	3	3	5,6,7
310.4		-		-	2	2	3	5,6,7
310.5					2	2	3	5,6,7
310.6					2	2	3	5,6,7

References:

a. Flint,ChrisandJamieFlockhart*isending:A2(CollinsEnglishforLife:Skills)*Collins.2013
b. Brown, StephenE. English in Everyday Life.McGraw-HillEducation.2008
c. Mohanraj,Jayashree.*LetUsHearThemSpeak:DevelopingSpeaking-ListeningSkillsin* English.Sage.2015
d. Susan Earle—Carlin. *QSkills for Success: Listening and Speaking5:Student Bookwith Online Practice.* Oxford University Press. 2013
e. Kumar, Sanjay and PushpaLatha. *Communication Skills: A Work* Book.Oxford University Press. 2018
f. Carnegie,Dale.*TheLeaderinYou.*Simon&Schuster:1995
g. Carnegie,Dale.*TheArtofPublicSpeaking.*PrabhatPrakashan.NewDeIhi.2013
h. Kaye,Martin.*GoalSetting(WorkbookIncluded):Goals&Motivation:IntroductionToA Complete&Proven Step-By-StepBlueprint ForReachingYourGoals(GoalSetting Master Plan 1).*Kindle Edition. MK Coaching.2016.
i. West,Steven.*CriticalThinkingSkills:PracticalStrategiesfor*Better*Decisionmaking,*
j. Tracy,Brain.*Goals.*Berret-KoehlerPublishersInc.SanFrancisco.2017
k. Tracy,Brain.*MasteryourTimeMasteryourLife.*PenguinRandomHouseInc.NewYork.2017
1. SeanCovey.*The7HabitsofHighly Effective Teens.*Simon andSchuster,2011

E-Learning Resources:

a. http://www.bbc.co.uk/wor1dservice/1eamingeng1ish/youmeus/1earnit/learnitv39.shtm1
b. https://www.exameng1ish.com/1eveltesg/1istenin leveltest.htm
c. https://www.oxfordon1ineenglish.com/1istening?utmreferrer=https%3A%2F%2Fwww.google.co.in%2F
d. https://takeie1ts.britishcounci1.org/prepare-test/free-ie1ts-practice-tests/listening-practice-test-1
e. https://learnenglish.britishcounci1.org/en/listening
f. https://www.cambridgeeng1ish.org/learning-english/activities-for-learners/?ski11=1istening
g. https://www.businesseng1ishsite.com/business-english-listening.html

BOARDDIPLOMAEXAMINATION(C-24)

MID SEMESTER EXAMINATION- I

HU-310-COMMUNICATIONSKILLSANDLIFESKILLS

Time: One Hour **Total Marks: 20**

Part – A **10 Marks**

1. Listening Comprehension (5 X 2 = 10)

Instruction: Questions shall be given before reading the passage

Emperor Ashoka was an emperor in ancient India. He was also called Ashoka the Great. He lived a long time ago, around 304 BCE. When he was young, he became the king of a big part of India after a fight for power.

At first, Ashoka wanted to win more land and power. He fought many wars and won many battles. But one day, during a battle in a place called Kalinga, Ashoka saw a lot of people suffering and dying. This made him feel very sad and sorry for what he had done. He decided he didn't want to fight anymore.

After this, Ashoka became a follower of Buddhism, a peaceful religion. He started to teach people about being kind and not hurting others. He wrote down his ideas on big stone pillars and put them all over his kingdom. These were called the "Edicts of Ashoka."

Ashoka did many good things for his people. He built hospitals for sick people and shelters for travelers. He also helped spread Buddhism to other countries.

Ashoka's time as king was a peaceful and happy time for India. He is remembered as a great leader who wanted everyone to be happy and peaceful.

Questions:

a. Who was Ashoka?

b. Why did Ashoka stop fighting wars?

c. What religion did Ashoka follow after he stopped fighting?

d. What were the "Edicts of Ashoka"?

e. Name one good thing Ashoka did for his people.

Part – B **10 Marks**

2. How can maintaining a positive attitude in the face of challenges contribute to personal and professional growth?
3. Give an example of a situation where you had to adapt to unexpected changes or circumstances. How did your adaptability skills help you navigate through the situation effectively?

BOARDDIPLOMAEXAMINATION(C-24)

MID SEMESTER EXAMINATION- II

HU-310-COMMUNICATIONSKILLSANDLIFESKILLS

Time: One Hour **Total Marks: 20**

Part – A **10 Marks**

1. Listening Comprehension (5 X 2 = 10)

Instruction: Questions shall be given before reading the passage

Prithviraj Chauhan was a courageous emperor who ruled parts of northern India during the 12th century. He was born into the Chauhan dynasty, a family known for its valor and leadership. Prithviraj ascended to the throne at a young age after the death of his father, Someshwar Chauhan.

Prithviraj's reign was marked by numerous military conquests and battles to defend his kingdom against rival Rajput clans and foreign invaders. He was renowned for his exceptional skill in warfare, especially archery and horse riding. His bravery and strategic prowess earned him the admiration of his allies and the fear of his enemies.

One of the most famous events in Prithviraj's life was his legendary rivalry with the Afghan ruler, Muhammad Ghori. The two clashed in a series of battles for supremacy in northern India. The most notable of these battles was the Battle of Tarain, fought in 1191 CE. Despite being outnumbered, Prithviraj displayed remarkable leadership and tactical brilliance, leading his forces to victory and capturing Muhammad Ghori.However, the tide turned in the subsequent battle at Tarain in 1192 CE. Due to a betrayal by one of his allies and underestimating Ghori's tactics, Prithviraj faced defeat and was captured. He was taken as a prisoner to Ghori's capital, where he met his tragic end.

Prithviraj Chauhan's legacy remains etched in the annals of Indian history as a symbol of bravery, resilience, and honor. His valorous deeds continue to inspire generations, and his name is remembered with reverence as one of India's greatest warriors and emperors.

Questions:

1. Who was Prithviraj Chauhan?
2. What dynasty did Prithviraj Chauhan belong to?
3. What were Prithviraj Chauhan's notable skills in warfare?
4. Describe the rivalry between Prithviraj Chauhan and Muhammad Ghori.
5. What happened to Prithviraj Chauhan after the Battle of Tarain in 1192 CE?

PART-B **10Marks**

Instruction:Answereither ofthequestionsin150words.

1. Why is it important to set clear and achievable goals in both personal and professional life? give an example of a goal you have set for yourself and explain how you plan to achieve it.
2. How do you use a ‘pen’ in ten different ways apart from using it for writing.

BOARDDIPLOMAEXAMINATION(C-24)

SEMESTER END EXAMINATION

HU-310-COMMUNICATIONSKILLSANDLIFESKILLS

Time: Three Hours **Total Marks: 40**

Part – A **10 Marks**

1. Listening Comprehension (5 X 2 = 10)

Instruction: Questions shall be giv3en before reading the passage

Gautama Buddha, also known simply as the Buddha, was a spiritual leader who lived in ancient India around the 6th century BCE. Born into a noble family in Lumbini, now located in present-day Nepal, Siddhartha Gautama, as he was originally named, led a life of luxury and privilege.

However, Siddhartha's life took a profound turn when he encountered the realities of human suffering. Despite being sheltered from the harshness of the world, he witnessed old age, sickness, and death, which deeply troubled him. Determined to find answers to the mysteries of life and alleviate human suffering, Siddhartha renounced his princely status and embarked on a spiritual quest.

For years, Siddhartha wandered the forests of India, seeking enlightenment through meditation and ascetic practices. After undergoing rigorous self-discipline and introspection, he finally attained enlightenment under a Bodhi tree in Bodh Gaya, Bihar. It was during this transformative moment that Siddhartha became the Buddha, meaning the "Enlightened One."

Following his enlightenment, the Buddha dedicated his life to teaching others the path to liberation from suffering. He expounded the Four Noble Truths and the Eightfold Path, which form the core teachings of Buddhism. The Four Noble Truths explain the nature of suffering, its causes, its cessation, and the path to its cessation, while the Eightfold Path outlines the ethical and spiritual practices necessary to achieve liberation.

The Buddha's teachings emphasized compassion, mindfulness, and inner peace. He encouraged his followers to cultivate wisdom and lead a virtuous life guided by right understanding, intention, speech, action, livelihood, effort, mindfulness, and concentration.

Throughout his lifetime, the Buddha traveled extensively across northern India, preaching his message of enlightenment and compassion to people from all walks of life. His teachings transcended social barriers and cultural boundaries, attracting followers from diverse backgrounds.

Gautama Buddha's legacy endures as one of the most influential spiritual figures in human history. His teachings continue to guide millions of people around the world on the path to inner peace, compassion, and liberation from suffering.

Comprehension Questions:

1. Who was Gautama Buddha, and when did he live?
2. What prompted Siddhartha Gautama to leave his life of luxury?
3. Where did Gautama Buddha attain enlightenment?
4. What are the Four Noble Truths and the Eightfold Path?
5. How did Gautama Buddha's teachings impact society?

PART-B **15Marks**

Instruction:Answeranyoneofthequestionsin150words.

2. Seminar on Life Skills Topics

PART- C **15Marks**

3. Viva Voce