O.P.Code:23ME0304	R23	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech.II Year I Semester Regular Examinations February-2025

MECHANICS OF SOLIDS

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Define strength and stiffness.	CO1	L2	2M
	b	State strain energy.	CO1	L1	2M
	c	What is meant by cantilever beam.	CO2	L1	2M
	d	Define shear force and bending moment at a section.	CO2	L1	2M
	e	State the theory of simple bending.	CO3	L2	2M
	f	Define shear stress distribution.	CO3	L1	2M
	g	Define deflection of beam.	CO4	L1	2M
	h	Write Torsion equation.	CO4	L1	2M
	i	What are the stress developed in the cylinders under pressure.	CO5	L2	2M
	j	Define thin and thick cylinder.	CO5	L1	2M

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2	a	Define stress and strain. Explain different types of stresses and strains.	CO1	L1	5M
	b	Draw and explain Stress-strain curve for a mild steel bar.	CO1	L2	5M

OR

3	a	A rod is 2 m long at a temperature of 10°C. Find the expansion of the rod when the temperature is raised to 80°C. If this expansion is prevented, find the stress induced in the material of the rod. Take E = 1.0 x 10^5MN/m^2 and α= 0.000012 per degree centigrade.	CO1	L3	5M
	b	A steel rod of 3 cm diameter and 5 m long is connected to two grips and the rod is maintained at a temperature of 95°C. Determine the stress and pull exerted when the temperature falls to 30°C, if (i) the ends do not yield, and (ii) the ends yield by 0.12 cm. Take E = 2 x 10^5 MN/m^2 and α = 12 x 10^{-6}/ ^{0}C	CO1	L3	5M

UNIT-II

4		A cantilever beam of length 3 m carries a uniformly distributed load of 1.5 kN/m run over a length of 2 m from the free end. Draw SFD and BMD for the beam.	CO1	L3	10M

OR

5		A cantilever of length 4.0 m carries a gradually varying load, zero at the free end to 2kN/m at the fixed end. Draw the S.F and B.M diagram .for the beam	CO1	L3	10M

UNIT-III

6		A rectangular beam 300 mm deep is simply supported over a span of 4 metres. Determine the uniformly distributed load per metre which the beam may carry, if the bending stress should not exceed 120 N/mm2.Take I = 8 x 10^6 mm^4	CO1	L3	10M

OR

7		A rectangular beam 100 mm wide and 250 mm deep is subjected to a maximum shear force of 50 kN. Determine: (i) Average shear stress, (ii) Maximum shear stress, and (iii) Shear stress at a distance of 25 mm above the neutral axis.	CO1	L3	10M
		UNIT-IV			
8		A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a uniformly distributed load of 9KN/m run over the entire span of 5 m. If the value of E for the beam material is 1 x 104 N/mm2, find: (i) The slope at the supports and (ii) Maximum deflection.	CO1	L3	10M
		OR			
9		A solid steel shaft has to transmit 75 KW at 200 rpm. Taking allowable shear stress as 70 N/mm2, find suitable diameter for the shaft, if the maximum torque transmitted at each revolution exceeds the mean by 30%.	CO1	L3	10M
		UNIT-V			
10	a	Derive expression for circumferential stress in thin cylinder.	CO5	L3	5M
	b	A cylindrical pipe of diameter 1.5m and thickness 1.5cm is subjected to an internal fluid pressure of 1.2 N/mm^2. Determine: (i) Longitudinal stress developed in the pipe, and ii) Circumferential stress developed in the pipe.	CO5	L3	5M
		OR			
11	a	A vessel in the shape of a spherical shell of 1.20 m internal diameter and 12 mm. shell thickness is subjected to pressure of 1.6 N/mm^2 Determine the stress induced in the material of the vessel.	CO5	L3	5M
	b	A spherical vessel 1.5 m diameter is subjected to an internal pressure of 2 N/mm^2. Find the thickness of the plate required if maximum stress is not to exceed 150 N/mm^2 and joint efficiency is 75%.	CO5	L3	5M

***** END *****