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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. II Year I Semester Regular & Supplementary Examinations November-2025

MECHANICS OF SOLIDS

(Mechnaical Engineering)

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

PART-A

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

1	a	State Hook's law	CO1	L1	2M
	b	Define strain energy.	CO1	L1	2M
	c	What is meant by cantilever beam.	CO2	L1	2M
	d	State point of contra flexure.	CO2	L1	2M
	e	Write the assumptions of simple bending.	CO3	L1	2M
	f	Define shear stress distribution.	CO3	L1	2M
	g	What are the methods for finding slope and deflection of a beam.	CO4	L1	2M
	h	State Maculays method.	CO4	L1	2M
	i	Write limitations of rankines formula.	CO5	L1	2M
	j	What are the stress developed in the cylinders under pressure.	CO5	L1	2M

PART-B

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

UNIT-I

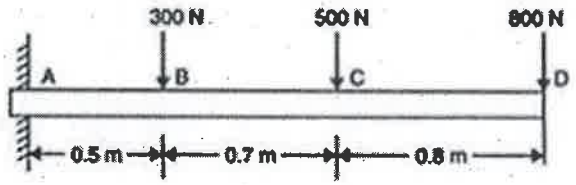
2	a	Draw and explain Stress-strain curve for a mild steel bar.	CO1	L1	3M
	b	A compound tube consists of a steel tube 140 mm internal diameter and 160 mm external diameter and an outer brass tube 160 mm internal diameter and 180 mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 900 kN. Find the stresses and the load carried by each tube and the amount it shortens. Length of each tube is 140 mm. Take E for steel as 2×10^5 N/mm^2 and for brass as1 $\times 10^5$ N/mm^2	CO1	L3	7M

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 10^3MN/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 = 2×10^5 MN/m^2 and α = 12×10^{-6} / ^{0}C.	CO1	L3	5M

UNIT-II

4		A cantilever beam of length 2m carries the point loads as shown in Fig. Draw the SFD and BMD for the given beam.	CO2	L3	10M



OR

5		A cantilever 1.5 m long is loaded with a uniformly distributed load of 2 kN/m run over a length of 1.25 m from the free end. It also carries a point load of 3 kN at a distance of 0.25 m from the free end. Draw the shear force and bending moment diagrams of the cantilever.	CO2	L3	10M

UNIT-III

6		A beam is simply supported and carries a uniformly distributed load of 40 kN/m run over the whole span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 N/mm^2 and moment of inertia of the section is 7×10^8 mm^4, find the span of the beam.	CO3	L3	10M

OR

7	a	A square beam 20 mm x 20 mm in section and 2 m long is supported at the ends. The beam fails when a point load of 400 N is applied at the centre of the beam. What uniformly distributed load per metre length will break a cantilever of the same material 40 mm wide, 60 mm deep and 3 m long	CO3	L1	6M
	b	Derive the expression for simple bending moment equation with assumptions	CO3	L3	4M

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 9 KN/m run over the entire span of 5 m. If the value of E for the beam material is 1×10^4 N/mm^2, find: (i) The slope at the supports and (ii) Maximum deflection	CO4	L3	10M

OR

9	a	Derive pure torsion equation for a circular shaft with assumptions.	CO4	L3	4M
	b	A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 N/mm^2	CO4	L3	6M

UNIT-V

10	a	Derive expression for circumferential stress in thin cylinder.	CO5	L3	4M
	b	A cylindrical thin drum 80cm in diameter and 3m long has a shell thickness of 1cm. If the drum is subjected to an internal pressure of 2.5 N/mm^2, Take E= 2×10^5 N/mm^2 and Poisson's ratio 0.25 Determine (i) change in diameter (ii) change in length and (iii) Change in volume.	CO5	L3	6M

OR

11		A closed cylindrical vessel made of steel plates 4 mm thick with plane and, carries fluid under a pressure of 3 N/ mm^2. The dia. of cylinder is 30 cm and length is 80 cm, calculate the longitudinal and hoop stresses in the cylinder wall and determine the change in diameter, length and volume of the cylinder. Take E = 2 X 10^5 N/ mm^2 and Poisson's ratio is 0.286	CO5	L3	10M

***** END *****