PVP 23

Code: 23ME3301

II B.Tech - I Semester – Regular / Supplementary Examinations
NOVEMBER 2025

MECHANICS OF SOLIDS
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Define Hooke's law.	L1	CO1
1.b)	What is Factor of Safety?	L1	CO1
1.c)	Define torsion.	L1	CO1
1.d)	What do you mean by fixed end moment?	L2	CO1
1.e)	Define section modulus.	L1	CO1
1.f)	What is shear flow in T-beam?	L2	CO1
1.g)	Define radius of curvature of a beam.	L1	CO1
1.h)	State the boundary conditions for simply supported beams.	L2	CO1
1.i)	Define hoop stress.	L1	CO1
1.j)	State Rankine's formula for columns.	L2	CO1

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Explain the stress strain diagram for mild steel.	L2	CO2	5 M
	b)	A bar of 20 mm diameter is subjected to a tensile load of 50 kN. If the extension in 200 mm gauge length is 0.25 mm and change in diameter is 0.003 mm, find stress, strain, Poisson's ratio and modulus of elasticity.	L3	CO2	5 M
OR					
3	a)	Explain the concept of principal stresses with suitable examples.	L2	CO2	2 M
	b)	At a point in a strained material, the principal stresses are 100 N/mm² (tensile) and 60 N/mm² (compressive) and shear stress is 30 N/mm^2. Determine i) Principal Stresses ii) Maximum shear stress iii) The normal stress and shear stress on a plane inclined at 45°.	L3	CO2	8 M
UNIT-II					
4	a)	Construct the shear force and bending moment diagrams for a cantilever beam of span 5 m carrying a point load of 20 kN at the free end.	L3	CO2	8 M

	b)	Explain the concept of "point of contraflexure" with an example.	L2	CO2	2 M
OR					
5	a)	Differentiate between solid shaft and hollow shaft.	L2	CO1	3 M
	b)	A solid shaft of 100 mm diameter transmits 150 kW at 200 rpm. Determine the shear stress and angle of twist for a length of 2 m. Take G = 80 GPa.	L3	CO2	7 M
UNIT-III					
6	a)	Draw the bending stress distribution for T – cross section.	L2	CO1	3 M
	b)	A simply supported beam of span 8 m carries a UDL of 10 kN/m. Determine maximum bending stress if I = 6×10^8 mm^4 and depth = 500 mm for a rectangular cross section.	L3	CO3	7 M
OR					
7	a)	Explain the shear stress distribution for an I-section.	L2	CO1	3 M
	b)	A rectangular section beam 200 mm × 300 mm is subjected to a shear force of 60 kN. Compute maximum shear stress.	L3	CO3	7 M
UNIT-IV					
8	a)	Explain the procedure for slope and deflection using Macaulay's method.	L2	CO1	3 M

	b)	A simply supported beam of 10 m span carries two point loads of 4 kN and 6 kN at 3 m and 7 m. Determine the deflection under each load (Take E = 200 GPa, I = 400×10^6 mm^4).	L3	CO3	7 M
OR					
9	a)	State Moment Area theorems.	L2	CO1	2 M
	b)	A cantilever beam of length 2.5 m carries a point load of 20 kN at the free end. Find the deflection and slope at the free end.	L3	CO3	8 M
UNIT-V					
10	a)	Derive expressions for change in diameter and volume of thin cylindrical shells.	L2	CO4	2 M
	b)	A thin cylinder of internal diameter 1.25 m and thickness 12 mm is subjected to internal pressure of 1.8 N/mm^2. Find the hoop and longitudinal stresses.	L3	CO4	8 M
OR					
11		A column 2.5 m long has a circular section of 150 mm diameter. Find the crippling load using Euler's formula for following end conditions if E = 2×10^5 N/mm^2 i) Fixed – Fixed ii) Pinned – Pinned	L3	CO4	10 M