PVP 23

Code: 23ME3301

II B.Tech - I Semester – Regular Examinations - DECEMBER 2024

MECHANICS OF SOLIDS
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

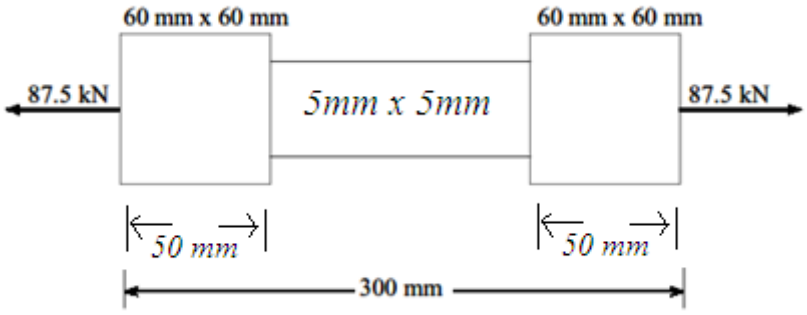
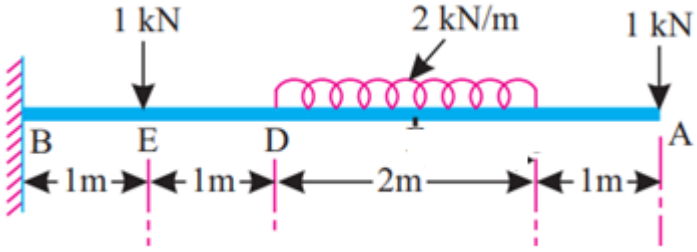
Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Define Young's Modulus.	L1	CO1
1.b)	Define Principal stress.	L1	CO1
1.c)	Define Bending Moment.	L1	CO1
1.d)	Write Torsion equation.	L1	CO1
1.e)	Define Pure bending.	L1	CO1
1.f)	What is the ratio of maximum to average shear stress in a rectangular section?	L2	CO1
1.g)	Write the governing differential equation of beams.	L1	CO1
1.h)	What is the maximum deflection when a point load 'W' is acting at the middle of the simply supported beam of length 'L'.	L2	CO1
1.i)	Define circumferential stress in thin cylinders.	L1	CO1
1.j)	What is slenderness ratio?	L2	CO1

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2		A tie bar has enlarged ends of square section 60 mm x 60 mm as shown in fig. If the middle portion of the bar is also of square section of 5mm x 5mm. Find the stress in each section and the total extension of the bar. Take E = 2 x 10^5 N/mm^2. 	L3	CO1	10 M
		OR			
3		The principal stresses at a point across two perpendicular planes are 75 MN/m^2 (tensile) and 35 MN/m^2 (tensile) and shear stress is zero. Find the stresses on a plane at 20° with the major principal plane.	L3	CO1	10 M
		UNIT-II			
4		Draw *SFD* and *BMD* for the following beam. 	L4	CO2	10 M
		OR			

5	What must be the length of a 5 mm diameter aluminum wire so that it can be twisted through one complete revolution without exceeding a shearing stress of 42 MN/m^2 ? Take: G = 27 GN/m^2.	L3	CO2	10 M
	UNIT-III			
6	A hollow circular bar having outside diameter twice the inside diameter is used as a beam. From the bending moment diagram of the beam, it is found that the bar is subjected to a bending moment of 40 kNm. If the allowable bending stress in the beam is to be limited to 100 MN/m^2, find the inside diameter of the bar.	L3	CO3	10 M
	OR			
7	A simply supported beam of 2-m span carries a uniformly distributed load of 140 kN per m over the whole span. The cross-section of the beam is a T-section with a flange width of 120 mm, web and flange thickness of 20 mm and overall depth of 160 mm. Determine the maximum shear stress in the beam and draw the shear stress distribution for the section.	L3	CO3	10 M
	UNIT-IV			
8	A simply supported beam 5 m long carries concentrated loads of 10 kN each at points 1m from the ends. Calculate: (i) Maximum slope and deflection of the beam, and (ii) Slope and deflection under each load. Take : EI = 1.2×10^4 kNm^2.	L4	CO3	10 M
	OR			

9	A simple beam of 4m span is carrying a point load of 40 kN at a distance of 3m from the left end. Calculate the slope at the two supports and deflection under the load. Take : EI = 2.6×10^7 N-m^2.	L4	CO3	10 M
	UNIT-V			
10	A cylindrical shell 3 m long which is closed at the ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also change in the dimensions of the shell if it is subjected to an internal pressure of 1.5 MN/m^2. Take: E= 200 GN/m^2 and μ= 0·3	L3	CO4	10 M
	OR			
11	Calculate the safe crippling load on a hollow cast iron column (one end rigidly fixed and the other hinged) of 150 mm external diameter, 100 mm internal diameter and 10 m length. Use Euler's formula with a factor of safety of 5, and E = 95 GN/m^2.	L3	CO4	10 M