PVP 23

Code: 23ME3301

II B.Tech - I Semester – Supplementary Examinations - MAY 2025

MECHANICS OF SOLIDS
(MECHANICAL ENGINEERING)

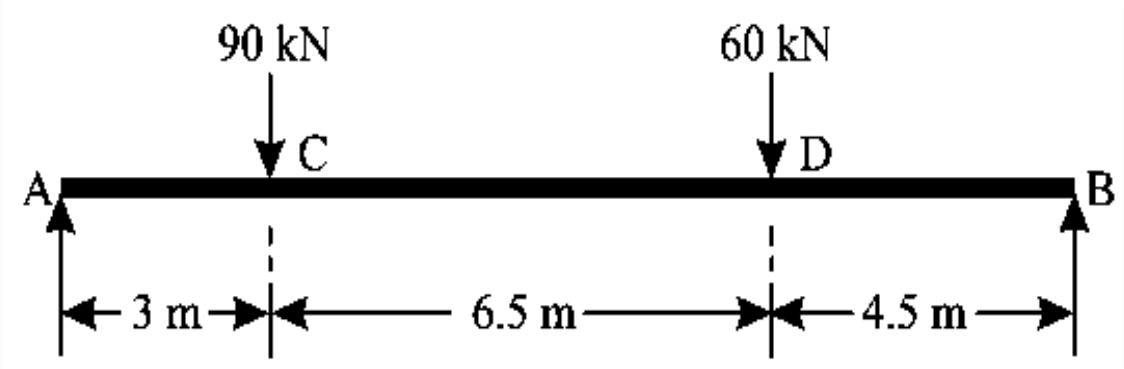
Duration: 3 hours Max. Marks: 70

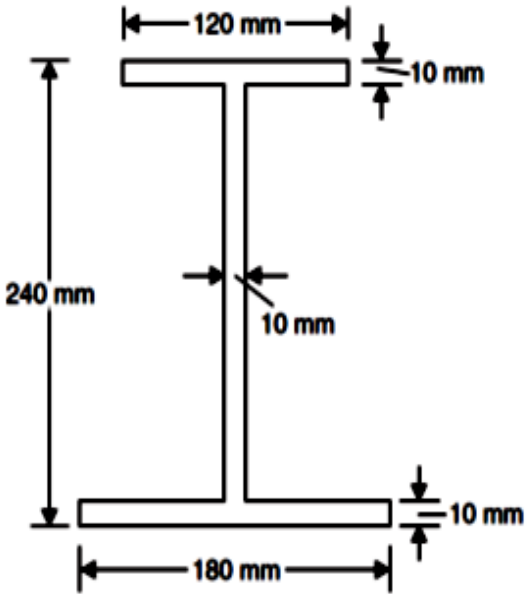
Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

PART – A

1.a)	Define Hook's law.
1.b)	What do you mean by Principal plane?
1.c)	Define Shear Force.
1.d)	Define Torque.
1.e)	Define Section modulus.
1.f)	What is the ratio of maximum to average shear stress in a rectangular section?
1.g)	Write the governing differential equation of beams.
1.h)	What is the maximum deflection when a point load 'W" is acting at the end of the cantilever beam of length 'L'.
1.i)	Define Longitudinal stress in thin cylinders.
1.j)	What is slenderness ratio?

PART – B

					Max. Marks
UNIT-I					
2	Tension test was conducted on a specimen and the following readings were recorded. Diameter = 25 mm Gauge length of extensometer = 200 mm Least count of extensometer = 0.001 mm At a load of 30 kN, extensometer reading = 60 At a load of 50 kN, extensometer reading = 100 Yield load = 160 kN Maximum load = 205 kN Diameter neck = 17 mm Final extension over 125 mm original length = 150 mm Find Young's Modulus, yield stress, ultimate stress, percentage elongation and percentage reduction in area.				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). Find the normal, tangential stresses and the resultant stress and its obliquity on a plane at 20° with the major principal plane.				10 M
UNIT-II					
4	Draw *SFD* and *BMD* for the following beam.  				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: C = 27 GN/m^2.	10 M
	UNIT-III	
6	Unsymmetric *I*-section shown in Fig. is used as a cantilever of span 2 m to carry uniformly distributed load of 6 kN/m over entire span. Draw the variation of bending stress across the depth marking the values at salient point.  	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.	10 M

	UNIT-IV	
8	A simply supported beam of 8-m length carries two point loads of 64 kN and 48 kN at 1 m and 4 m respectively from the left-hand end. Find the deflection under each load and the maximum deflection. E = 210 GPa and I = 180 x 10^6 mm^2.	10 M
	OR	
9	The distance between the supports of a simply supported beam is *l*. The beam has two equal overhangs of length 'a' over each support. The beam carries a point load 2W at the centre and a point load W at each end. Determine (i) The slopes at the ends and at the supports. (ii) The deflection at the ends and at the centre.	10 M
	UNIT-V	
10	A cylindrical shell, 600 mm in diameter, thickness of metal 12 mm and 2.4 m long, is subjected to an internal pressure of 1.6 N/mm^2.Calculate the change in diameter, length and volume of the shell under pressure. E = 2 x 10^5 N/mm^2. Poisson's ratio = 0.3.	10 M
	OR	
11	A bar of length 4 m when used as a simply supported beam and subjected to a u.d.l. of 30 kN/m over the whole span, deflects 15 mm at the centre. Determine the crippling loads when it is used as a column with following end conditions: (i) Both ends pin-jointed; (ii) One end fixed and other end hinged; (iii) Both ends fixed.	10 M