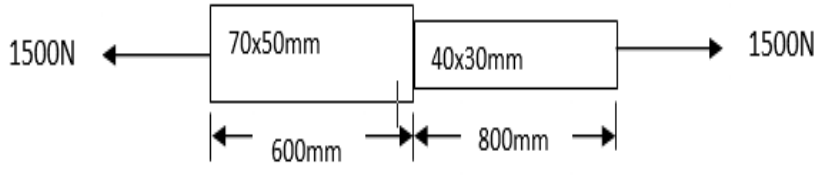
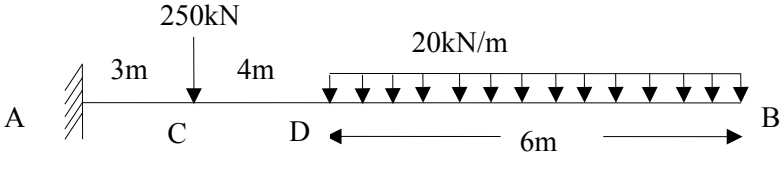
Code No: P21MET02

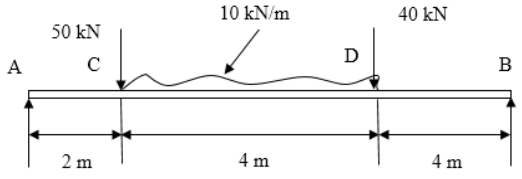
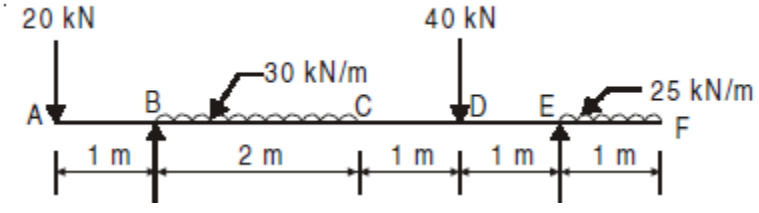
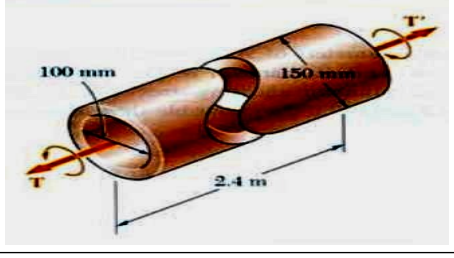
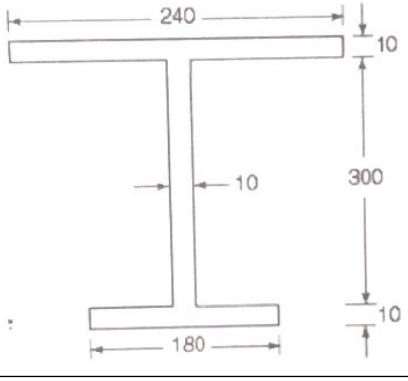
HALL TICKET NUMBER

PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)
II B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, MARCH/APRIL - 2023
MECHANICS OF SOLIDS
(ME Branch)

Time: 3 hours Max. Marks: 70

Answer all the questions from each UNIT (5X14=70M)

Q.No.		Questions	Marks	CO	KL
		UNIT-I			
1.	a)	An aluminium bar 60mm diameter when subjected to an axial tensile load 100kN elongates 0.20mm in a gauge length 300mm and the diameter is decreased by 0.012mm. Calculate the Modulus of elasticity and the Poisson's ratio of the material	[7M]	1	3
	b)	Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter of 25 mm and of length 1.6 m, if the longitudinal strain in a bar during a tensile test is four times the lateral strain. Find the change in volume, when the bar is subjected to a hydrostatic pressure of 100 N/mm^2. Take young's modulus = 1×10^5 N/mm^2	[7M]	1	3
		OR			
2.	a)	Determine total elongation for the bar shown in the Fig.1 Take $E=2.1x10^5$ N/mm^2 	[7M]	1	3
	b)	A steel bolt 25 mm diameter and 30 cm long passes through a copper tube having internal and external diameters of 30 mm and 40 mm respectively. The bolt has 4 threads per cm and the nut is initially just tight. Calculate (i) the angle through which nut is turned through to cause a tensile stress of 80 MPa in the bolt, (ii) stress in the tube, and (iii) the change in stress in the bolt and the tube due to an increase in temperature of 30ºC. young's modulus of steel = 200GPa, young's modulus of copper =100 GPa, co-efficient of linear expansion for steel =10×10^{-6} per ºC , co-efficient of linear expansion for copper =15×10^{-6} per ºC	[7M]	1	3
		UNIT-II			
3.	a)	A simply supported beam of length 6m, carries a point load of 3kN at distances of 2m and 4m from the left end. Draw the shear force and bending moment diagram for the beam.	[7M]	2	4
	b)	Determine the shear force and bending moment values at A, B, C & D for the cantilever beam shown in Fig. also draw S. F. D and B. M. D. 	[7M]	2	3
		OR			

4.	a)	A simply supported beam of length 10m, carries the uniformly distributed load and two point loads as shown in fig. Draw the Shear Force diagram for the beam. Also calculate the Maximum Shear Force 	[7M]	2	3
	b)	Draw the Bending moment diagram for the beam given indicating the values at all salient points. 	[7M]	2	2
		UNIT-III			
5.	a)	Derive the expression for maximum shear stress intensity in a rectangular cross section of breadth 'b' and depth'd'. Also sketch the shear stress distribution across the section	[7M]	3	2
	b)	The preliminary design of a large shaft connecting a motor to a generator coils for the use of a hollow shaft with inner and outer diameters of 100mm and150 mm respectively. Knowing that the allowable shearing stress is 84MPa, determine the maximum torque that is transmitted by shaft as designed 	[7M]	3	3
		OR			
6.	a)	Derive simple bending equation.	[7M]	3	4
	b)	I – section shown in fig. is subjected to a bending moment of 15 kN-m, the top flange was under compression. Draw the stress variation diagram across the section marking the salient points and compute the total moment resisted by the top flange. 	[7M]	3	4

		UNIT-IV			
7.	a)	What is the advantage of conjugate beam method over other methods?	[7M]	4	3
	b)	A beam AB simply supported at the ends is 8 m long. It carries a uniformly distributed load of intensity 10 kN/m over a length of 4 m starting at a distance of 4 m from left end support together with a concentrated load of 48 kN at a distance of 2 m from left end support. Find using Macaulay's method (i) slope at each end (ii) Deflection at the centre and (iii) maximum deflection. Take young's modulus = 200 kN/mm^2 and moment of inertia = 6.5 $\times 10^8$ mm^4.	[7M]	4	2
		OR			
8.	a)	A beam 3 m long, simply supported at its ends, is carrying a point load W at the centre. If the slope at the beam should not exceed 1º, find the deflection at the centre of the beam.	[14M]	4	3
		A beam of length *l* is simply supported at the ends and carries a concentrated load W at a distance 'a' from each end. Find using conjugate beam method the slope at each end and under each load. Find also the deflection under each load and at the centre.			
		UNIT-V			
9.	a)	A cylindrical shell 100 cm long 18 cm internal diameter having thickness of metal as 8 mm is filled with fluid at atmospheric pressure. If an additional 20 cm^3 of fluid is pumped into cylinder find (i) the hoop stress induced. Take Young's modulus E = 2$\times$ 10^5 N/mm^2 and Poisson's ratio = 0.3	[7M]	5	3
	b)	Derive an expression for radial pressure and hoop stress for a thick cylindrical shell	[7M]	5	4
		OR			
10.	a)	A cylindrical thin drum 80 cm in diameter and 3 m long has a shell thickness of 1 cm. If the drum is subjected to an internal pressure of 2.5 N/mm2, determine (i) Change in diameter (ii) Change in length and Change in volume. Take E = 2$\times$ 10^5 N/mm^2, Poisson's ratio = 0.25.	[10M]	5	3
	b)	A spherical shell of internal diameter 0.9 m and of thickness 10 mm is subjected to an internal pressure of 1.4 N/mm2. Determine the increase in diameter and increase in volume. Take E = 2$\times$ 10^5 N/mm^2, Poisson's ratio = 1/3.	[4M]	5	4

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