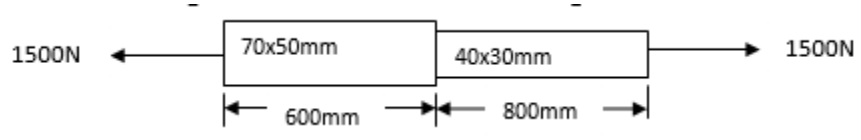
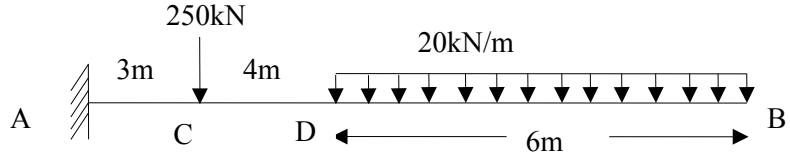
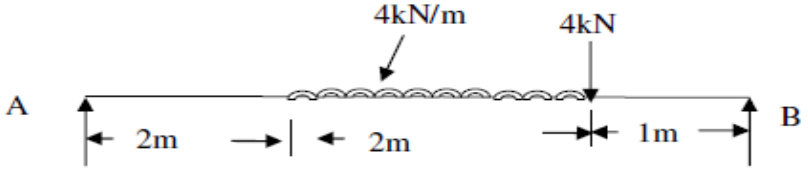
Code No: P21MET02

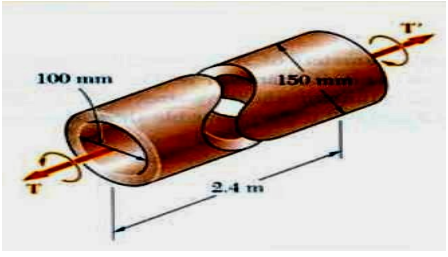
HALL TICKET NUMBER

PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)
II B.TECH I SEMESTER END REGULAR EXAMINATIONS, JAN - 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)	A steel rod of 3cm diameter and 5 cm long is connected to two grips and the rod is maintained at a temperature of 95ºC. Determine the stress and pull exerted when the temperature falls to 30 ºC, 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 $\alpha = 12\times10^{-6}$ / ºC.	[7M]	1	3
	b)	An aluminium bar 60mm diameter when subjected to an axial tensile load 100kN elongates0.20mm 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
		OR			
2.	a)	Determine total elongation for the bar shown in the Fig. Take E=2.1x10^5 N/mm^2 	[8M]	1	3
	b)	In a material the principal stresses are 50 N/mm^2, 40 N/mm^2 and -30 N/mm^2,calculate: i. Volumetric strain energy ii. Shear strain energy and iii. Factor of safety on the total strain energy criterion if the material yield at 100 N/mm^2. Take E = 200 x 10^3 N/mm^2 and Poisson ratio = 0.28	[6M]	1	3
		UNIT-II			
3.	a)	Derive the relationship between Shear Force (SF), Bending Moment (BM) and Rate of loading (w).	[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 beam 5m long rest on two supports carries a U.D.L of 4kN/m and concentrated load 4kN as shown in Fig. Draw SFD and BMD for the beam. 	[7M]	2	3

	b)	Explain about the point of contra flexure.	[7M]	2	2
		UNIT-III			
5.	a)	List all the assumptions made in deriving the bending equation	[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 the shear stress distribution along the cross-section of triangular	[7M]	3	4
	b)	Derive the shear stress distribution along the cross-section of I section	[7M]	3	4
		UNIT-IV			
7.	a)	A beam of length 5 m and a uniform rectangular section is simply supported at its ends. It carries a uniformly distributed load of 9 kN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm^2 and central deflection is not exceed 1 cm. Take E for beam material 1×10^4 N/mm^2	[7M]	4	3
	b)	What is the advantage of conjugate beam method over other methods?	[7M]	4	2
		OR			
8.	a)	A simply supported beam of length 5 m carries a point load of 5 kN at a distance of 2.5 m from the left end. If $E = 2\times10^5$ N/mm^2 and $I = 10^8$ mm^4, determine the slope at the support and deflection under the point load.	[14M]	4	3
		UNIT-V			
9.	a)	A thin cylindrical shell 2.5 m long has 700 mm internal diameter and 8 mm thickness. If the shell is subjected to an internal pressure of 1 MPa, find, the changes in diameter, length and volume. Take modulus of elasticity of the wall material as 200 GPa and Poisson's ratio as 0.3.	[7M]	5	3
	b)	Derive an expression for volumetric strain in cylindrical shell	[7M]	5	4
		OR			
10.	a)	A cylindrical pipe of diameter 1.5m and thickness 1.5 cm is subjected to an internal pressure of 1.2 MPa. Determine hoop and longitudinal stresses developed in the pipe?	[10M]	5	3
	b)	Derive an expression for radial pressure and hoop stress for a thick cylindrical shell	[4M]	5	4

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