Code - 00002003

G. S. Mandal's

Maharashtra Institute of Technology, Aurangabad

(An Autonomous Institute)

END SEMESTER EXAMINATION

Second Year B.Tech (Mechanical) – Feb/Mar-2023

Course Code: MED-201 **Course Name: Strength of Materials**

Duration: 2 Hrs **Max. Marks: 50** **Date: 10.01.2023**

03 FEB 2023

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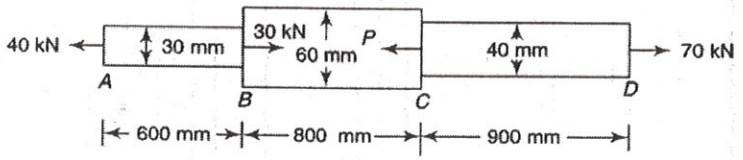
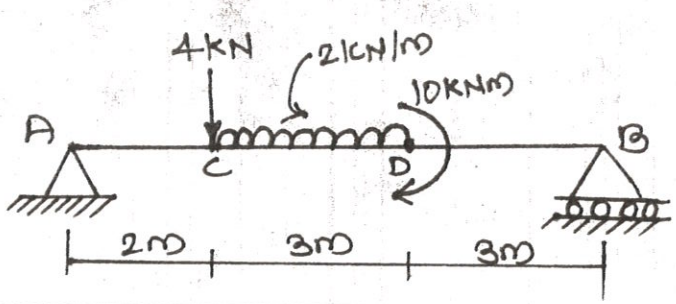
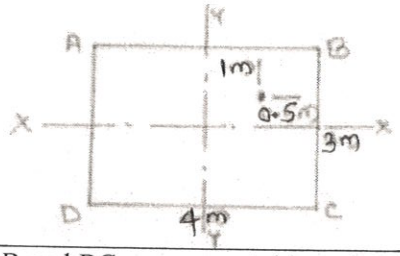
Instructions:

i) **All questions are compulsory**

ii) **Assume suitable data wherever necessary and clearly state it**

iii) **Figures to right indicate full marks**

Q. 1	Answer any five (Marks:10)				
		Marks	CO	BL	PI
a)	Define stress and write its unit?	2	1	1	1.1.1
b)	Draw stress-strain curve for brittle material?	2	1	1	1.1.1
c)	Classify the types of beams?	2	1	1	1.1.1
d)	Define circumferential and longitudinal stress.	2	1	1	1.1.1
e)	Define core or kernel of a section?	2	2	2	1.1.1
f)	Define principal plane?	2	2	2	1.1.1
g)	Define torsional stiffness?	2	2	2	1.1.1
h)	Define proof resilience?	2	2	2	1.1.1
Q.2	a) A circular steel bar having three segments is subjected to various forces at different cross-sections as shown in figure. Determine the necessary force to be applied at the section C for the equilibrium of the bar. Also, find the total elongation of the bar. Take E=202 GPa.  **OR** b) Draw shear force and bending moment diagram for the following loaded beam. Also calculate the maximum bending moment.  	8	3	3	1.4.1
Q.3	A cylindrical shell 2 m long and 1 m internal diameter is 20 mm thick. Find the circumferential and longitudinal stresses when it is subjected to an internal pressure of 12 N/mm^2. Also find the changes in the dimensions. Take E = 210 GPa and μ = 0.30.	8	3	3	1.4.1

Q.4	A masonry pier 3m x 4m supports a vertical point of 600 kN as shown in figure. Neglect the self-weight of the pier and find, a) Stresses developed at each corner of the pier. b) What additional load is to be placed at the centre of the pier so that there is no tension anywhere in the pier section? c) What are the stresses at the corners with the additional load in the centre? 	8	4	4	2.3.1
Q.5	Two shafts AB and BC are connected in series. The diameters of AB and BC are 100 mm and 50 mm respectively. And their lengths are 200 mm and 300 mm respectively. Both the shafts are made of the same material having modulus of rigidity as 8 x 10^4 N/mm^2. Determine the shear stresses set up in the shaft and total angle of twist. Also draw the angle of twist diagram if the torque applied at the one end is 10 kNm.	8	5	4	2.4.1
Q.6	Solve graphically, at a point in an elastic material under strain, there are normal stress of 100 N/mm^2 (Tensile) and 50 N/mm^2 (Tensile) respectively at right angles to each other with a sharing stress of 25 N/mm^2. Find the principal stresses, the position of principal planes, maximum shear stress and intensity of normal stress on the plane of maximum shear. **OR** Discuss in detail the concept of Castigliano's theorem.	8	6	5	3.1.6

Note: - All course outcomes shall be addressed.