Question Paper Code: R18A21ME01

R18

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, Jan/Feb-2024

MECHANICS OF SOLIDS

(MECHANICAL ENGINEERING)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

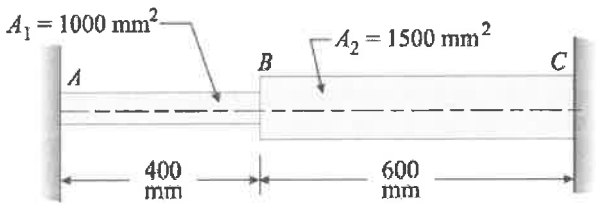
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Define resilience.	CO1	L1	2M
2.	Explain the factor of safety calculation procedure for ductile and brittle materials.	CO1	L2	3M
3.	Define shear force.	CO2	L1	2M
4.	Discuss various types of beam-supports and their reactions.	CO2	L2	3M
5.	Define section modulus.	CO3	L1	2M
6.	With example explain pure bending and pure shear.	CO3	L2	3M
7.	State Mohr's theorems.	CO4	L1	2M
8.	Discuss the procedure of beam deflection measurement.	CO4	L2	3M
9.	Define radial stress.	CO5	L1	2M
10.	Derive the ratio of circumferential stress to longitudinal stress in a thin cylindrical shell.	CO5	L2	3M

Section B (Essay Questions)

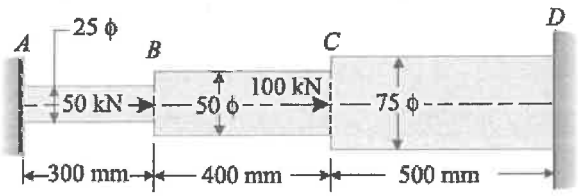
Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	A stepped steel rod ABC firmly held at A and C as shown in Fig. 1. If the rod is heated through 20 K, find the stresses developed in the parts AB and BC.	CO1	L3	10M

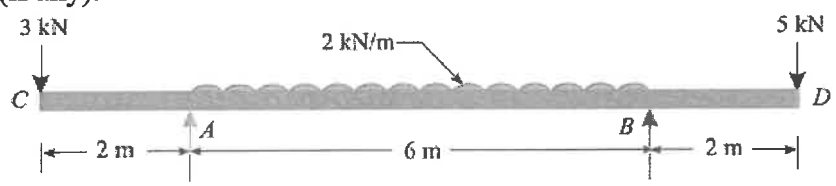


OR

B)	A circular copper bar ABCD, rigidly fixed at A and D is subjected to axial loads of 50 kN and 100 kN at B and C as shown in Fig. 2. Which part of the bar is stressed more? Justify your answer. Take E for the copper as 90 GPa.	CO1	L3	10M

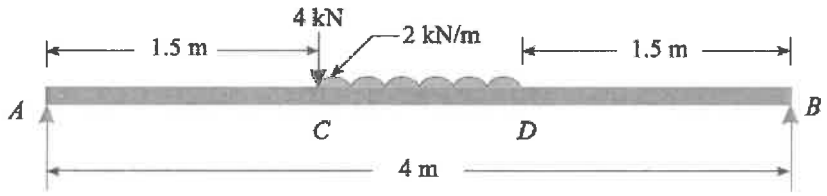


12. A)	An overhanging beam 10 m long loaded as shown in Fig. 3. Draw shear force and bending moment diagram. Locate the points of contraflexure (if any).	CO2	L3	10M

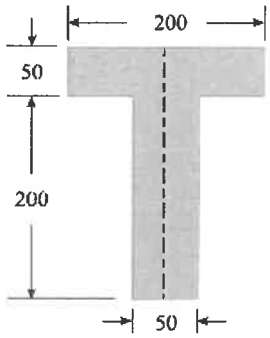


OR

B)	A 5 m long simply supported beam is carrying loads as shown in Fig. 4. Draw the SFD and BMD. Locate the point of contraflexure (if any).	CO2	L3	10M



13. A)	A T-beam section shown in Fig. 5 is subjected to a vertical shear force of 100 kN. Calculate the shear stress at important points and draw shear stress distribution diagram. Take moment of inertia about the horizontal neutral axis is 113.4 x 10^6 mm^4.	CO3	L3	10M



OR

B)	A hollow square section with outer and inner dimensions of 50 mm and 40 mm respectively is used as a cantilever beam of span 1.5 m. If the bending stress is not to exceed 55 MPa, estimate the maximum concentrated load which can be applied at the free end of the cantilever.	CO3	L3	10M
14. A)	A cantilever beam 100 mm wide and 180 mm deep is projecting 2.5 m from a wall. Find the UDL, which the beam should carry, if the deflection of the free end should not exceed 4 mm. Also determine the maximum slope. Take E of beam material as 200 GPa.	CO4	L3	10M

OR

B)	A wooden beam 120 mm wide and 240 mm deep has a span of 5 m. Determine the point load, that can be placed at its centre to cause the beam maximum deflection of 8 mm. Also find the maximum slope. Take E of wood as 6 GPa.	CO4	L3	10M
15. A)	A thick metallic cylindrical shell of 150 mm internal diameter is required to withstand an internal pressure of 8 N/mm^2. Find the necessary thickness of the shell, if the permissible tensile stress in the section is 20 N/mm^2.	CO5	L3	10M

OR

B)	A thin cylindrical shell 3 m long has 1 m internal diameter and 15 mm metal thickness. Calculate the changes in dimensions of the shell if the shell is subjected to an internal pressure of 1.5 MPa. Take E = 200 GPa and Poisson's ratio = 0.3.	CO5	L3	10M