Code No: R22031 **R10** SET - 1

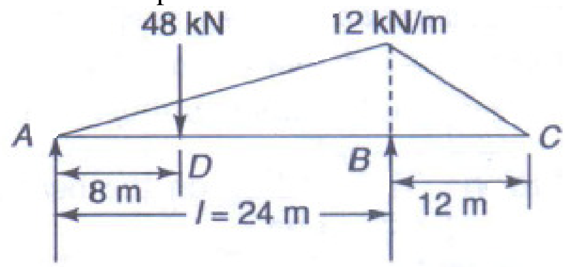
II B. Tech II Semester Supplementary Examinations, November-2017
MECHANICS OF SOLIDS
(Com. to ME, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) An unknown weight falls through a height of 10 mm on a collar rigidly attached to the lower end of a vertical bar 500 cm long and 600 mm^2 in section. If the maximum extension of the rod is to be 2mm, what is the corresponding stress and magnitude of the unknown weight? Take $E = 2\times10^5$ N/mm^2.
   b) Two vertical rods one of steel and the other of copper are each rigidly fixed at the top and 60cm apart. Diameters and lengths of each rod are 3cm and 3.5cm respectively. A cross bar fixed to the rods at the lower ends Carries a load of 5000N such that the cross bar remains horizontal even after loading. Find the stress in each rod and position of the load on the bar. Take E_s = 2.x 10^5 N/mm^2, E_c = 1x 10^5 N/mm^2 (7M+8M)

2. a) Draw the sheer force and bending moment diagram for given below figure**.** Also find the maximum bending moment and point of contra flexure.

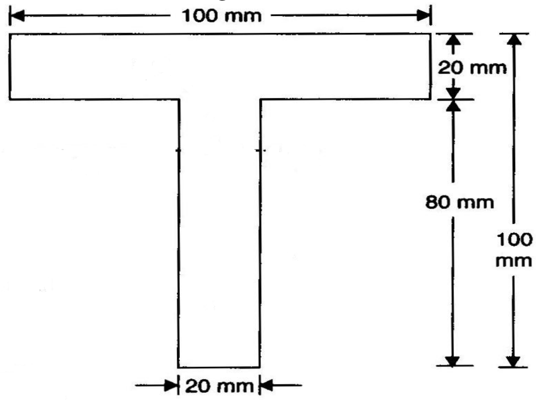


   b) A 10m long beam ABC is simply supported at A and B, B being 2m from the right end of the beam. It carries point loads of 8kN and 4kN at a distance 3m and 5m from A. The beam also has uniform distributed loads of intensity 4kN/m for a distance of 4m starting from A and of 6kN/m on BC. Draw the shear force and bending moment diagrams indicating principal values. (8M+7M)

3. a) The tension flange of a cast iron I-section beam is 240mm wide and 50mm deep, the compression flange is 100mm wide and 20mm deep where as the web is 300mm×30mm. Find the load per meter run which can be carried over a 4m span by a simply supported beam if the maximum permissible stresses are 90MPa in compression and 24MPa in tension.
   b) Calculate the maximum stress induced in a cast iron pipe of external diameter 40mm, of internal diameter 20mm and of Length 4m when the pipe is supported at its ends and carries a point load of 80N at its center. (8M+7M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R22031 **R10** SET - 1

4. a) The shear stress acting on a section of a beam is 50kN, the section of the beam is T- shaped of dimensions 100mm ×100mm × 20mm as shown in **Fig.** the moment of inertia about horizontal neutral axis is 314.221×10^4 mm^4. Calculate the shear stress at the neutral axis and at the junction of the web and the flange.



b) Determine the maximum shear stress for a circular section of radius ***R*** and shear force acting on the section Is ***F***. (8M+7M)

5. a) A truss of span 5m is loaded as shown in Figure 1, find the reactions and forces in the members marked 4, 5 and 7 using method of section.

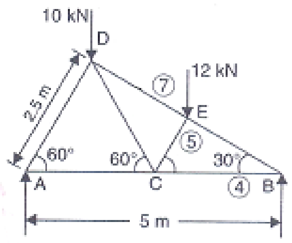


Figure 1

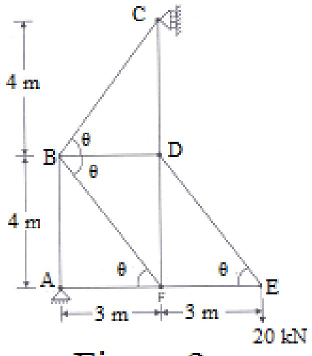


Figure 2

b) Analyze the plane truss shown in Figure 2, by the method of joints. (7M+8M)

6. a) Derive the relation between slope, deflection and radius of curvature.
b) A beam 3m long, simply supported at its ends, is carrying a point load W at the center. If the slope at the ends of the beam should not exceed 1^0, find the deflection at the center of the beam. (7M+8M)

7. a) Derive the expressions for hoop, longitudinal and volumetric strains for thin cylinders
b) A water main 80 cm diameter contains water at a pressure head of 100m. If the weight density of water is9810N/m^3, find the thickness of the metal required for the water main. Given the permissible stress as 20 N/mm^2. (10M+5M)

8. a) Derive the stresses in compound thick cylinders due to internal fluid pressure
b) Find the thickness of metal necessary for a cylindrical shell of internal diameter 160mm to with stand an internal pressure of 8N/mm^2, the maximum hoop stress in the section is not to exceed 35N/mm^2. (8M+7M)