Code No: 153BU **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2021
STRENGTH OF MATERIALS - I
(Civil Engineering)

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

Answer any five questions
All questions carry equal marks

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1.a) Draw the stress-strain diagram for mild steel and explain salient points.

b) A solid steel bar 1000 mm long and 50 mm diameter, is placed inside an Aluminium tube of 60 mm inside diameter and 75 mm outside diameter. The aluminum tube is 1.5 mm longer than steel bar. An axial load of 500 kN is applied to the bar and tube through rigid cover plates. Assess the stresses developed in the steel bar and Aluminium tube. Adopt E for steel = 2×10^5 N/mm^2 and E for Aluminium = 0.7×10^5 N/mm^2. [7+8]

2.a) Build the relation between the modulus of elasticity and modulus of rigidity.

b) A vertical steel rod 1200 mm long is fixed at its top and a weight of 500 N is dropped from a height of 600 mm on to a collar at the lower end. The upper 800 mm length of the rod is has a diameter of 25 mm while the reaming portion has 20 mm diameter. Determine the maximum instantaneous stress induced in the rod. [8+7]

3. A simply supported beam subjected to the loading as shown in Figure 1. Draw the shear force and bending moment diagrams. [15]

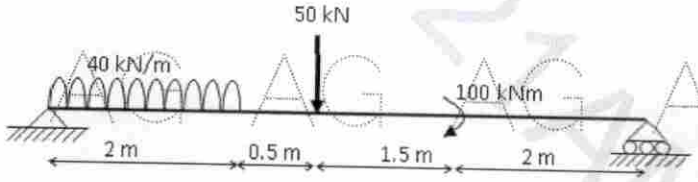

Figure: 1

4. Draw the shear force and bending moment diagrams for a beam supported and loaded as shown in Figure 2. [15]

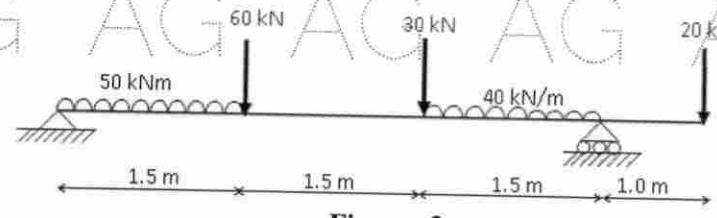

Figure: 2

5. A simply supported steel beam of span 6 m has an unsymmetrical I-section, top flange 150 mm × 10 mm, bottom flange 100 mm × 12 mm, web 8 mm thick and the overall depth of the beam is 300 mm. Determine the maximum uniformly distributed load the beam can support, if the permissible stresses are 125 N/mm^2 in compression and 175 N/mm^2 in tension. [15]

6. A simply supported beam of span 5 m carries a uniformly distributed load of 60 kN/m over its entire span. The cross-section of the beam has a T-section with flange width 150 mm, flange thickness 12 mm, web thickness 10 mm and overall depth 250 mm. Draw the distribution of shear stress across the depth of the section, subjected to maximum shear force. Also find the ratio of maximum shear stress to the average shear stress. [15]

7. Determine the location and magnitude of maximum deflection and the slopes at the supports of a beam supported and loaded as shown in Figure 3. [15]

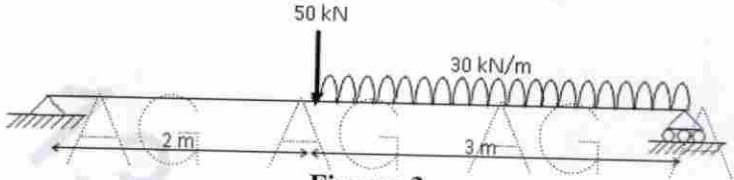

Figure: 3

8. Explain the following theories of failure:
a) Maximum principal strain theory
b) Shear strain energy theory. [7+8]

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