Code No: 53016 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, February/March - 2016

MECHANICS OF SOLIDS

(Common to ME, MCT, MMT, AE, AME)

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

Answer any five questions

All questions carry equal marks

\- - -

1.a) Two vertical rods one of steel and other of copper are rigidly fixed at the top and 80 cm apart. Diameter and length of each rod are 3 cm and 3.5 m respectively. A cross bar fixed to the rods at lower ends carries a load of 6 kN such that the cross bar remains horizontal even after loading. Find the stress in each rod and position of load on the bar. Take E for steel as 2×10^5 N/mm^2 and for copper as 1×10^5 N/mm^2.

b) What are the effects of temperature on the stresses developed in the solids? Explain different types of thermal stresses. [8+7]

2.a) Differentiate between hogging and sagging bending moment.

b) A simply supported beam of length 10 m carries the uniformly distributed load and two point loads as shown in Figure 1. Draw the S.F and B.M diagram for the beam and also calculate the maximum bending moment. [7+8]

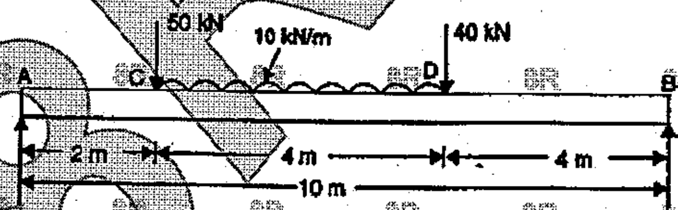

Figure: 1

3.a) A 100 mm × 200 mm rolled steel I section has the flanges 12 mm thick and web 10 mm thick. Find (i) The safe udl the section can carry over a span of 6 m if the permissible stress is limited to 150 N/mm^2, (ii) The maximum bending stress when the beam carries a central point load of 20 kN.

b) How would you find the bending stress in unsymmetrical sections? Explain. [8+7]

4.a) An I section beam 350 × 150 mm as shown in Figure 2 has a web thickness of 10 mm and a flange thickness of 20 mm. If the shear force acting on the section is 40 kN, find the maximum shear stress developed in the I section.

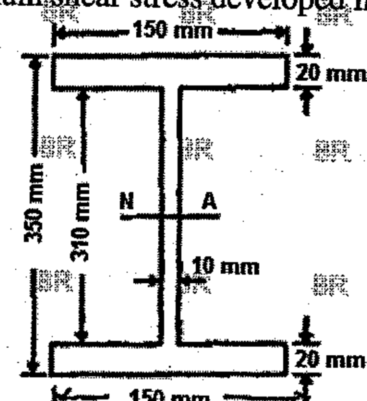

Figure: 2

b) What are the assumptions used for the estimation of shear stress distribution in different sections? Explain. [8+7]

5. A cantilever truss is show in Figure 3. Find the forces in the members of the truss by the method of joint. [15]

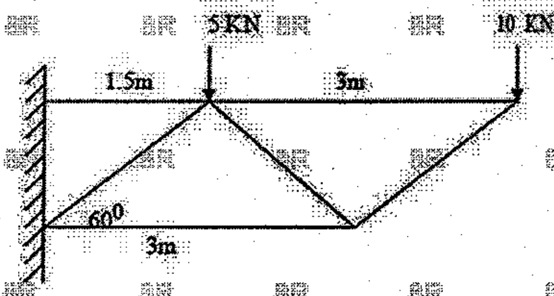

Figure: 3

6.a) When do you prefer Moment area method? Explain.

b) Using conjugate beam method, obtain the slope and deflections at A, B, C and D of the beam shown in Figure 4. Take E = 200 GPa and I = 2×10^{-2} m^4. [7+8]

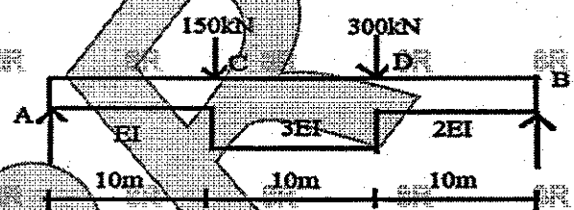

Figure: 4

7.a) A thin walled sphere is 120 mm mean diameter with a wall 1 mm thick. The pressure outside is 1 MPa more than the pressure inside. Then calculate the hoop stress and longitudinal stress by considering the efficiency of joint as 80%. Take E = 200 GPa and poisons ratio = 0.26.

b) How to calculate the change in volume of thin spherical shells? Explain. [8+7]

8. A compound steel cylinder has a bore of 80 mm and an outside; diameter of 160 mm, the diameter at the common surface being 120 mm. Find the radial pressure at the common surface which must be provided by shrinkage if the resultant maximum hoop tension in the inner cylinder under a superimposed internal pressure of 60 N/mm^2 is to be half the value of the maximum hoop tension which would be produced in the inner cylinder if that cylinder alone were subjected to an internal pressure of 60 N/mm^2. Determine the final hoop tensions at the inner and outer surfaces of both cylinder under the internal pressure of 60 N/mm^2 and sketch a graph to show the hoop tension varies across the cylinder wall. [15]

---ooOoo---