Code No: 53016 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, December-2014
MECHANICS OF SOLIDS
(Common to ME, MCT, MMT, AE, AME, MSNT)

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

Answer any five questions
All questions carry equal marks

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1.a) Three bars made of copper; zinc and aluminium are of equal length and have cross section 500, 700, and 1000 sq.mm respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250 kN, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10^5 N/mm^2, for zinc = 1×10^5 N/mm^2 and for aluminium = 0.8×10^5 N/mm^2.

b) Derive the relation among all the three modulii based on the elasticity equations.

2.a) What is the differential relation between bending moment, shear force and the applied load?

b) Draw shear force and bending moment diagram for the beam given in Figure 1.

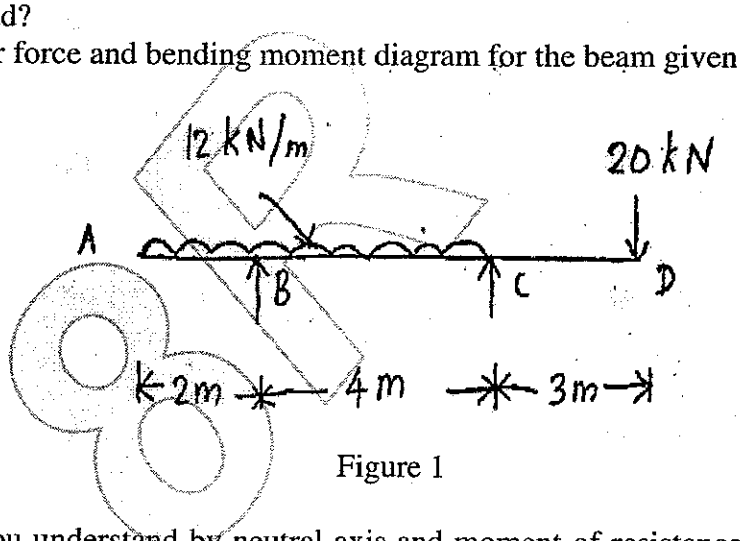

Figure 1

3.a) What do you understand by neutral axis and moment of resistance? How do you locate Neutral axis?

b) A simply supported beam of span 4m carries a udl of 6kN/m over the entire span. If the maximum allowable stress due to bending is restricted to 150 N/mm^2, determine the cross sectional dimensions if the section is; (i) Rectangular with depth twice the breadth (ii) Solid circular section (iii) Hollow circular section having a diameter ratio of 0.6.

4.a) Derive the equation for the estimation of shear stress distribution in circular cross section and also calculate the maximum shear stress.

b) A timber beam of rectangle section is simply supported at the ends and carries a point load at the center of the beam. The maximum bending stress is 12 N/mm^2 and maximum shearing stress is 1 N/mm^2, find the ratio of the span to the depth.

5. Determine the forces in the truss shown in Figure 2 which is subjected to inclined loads.

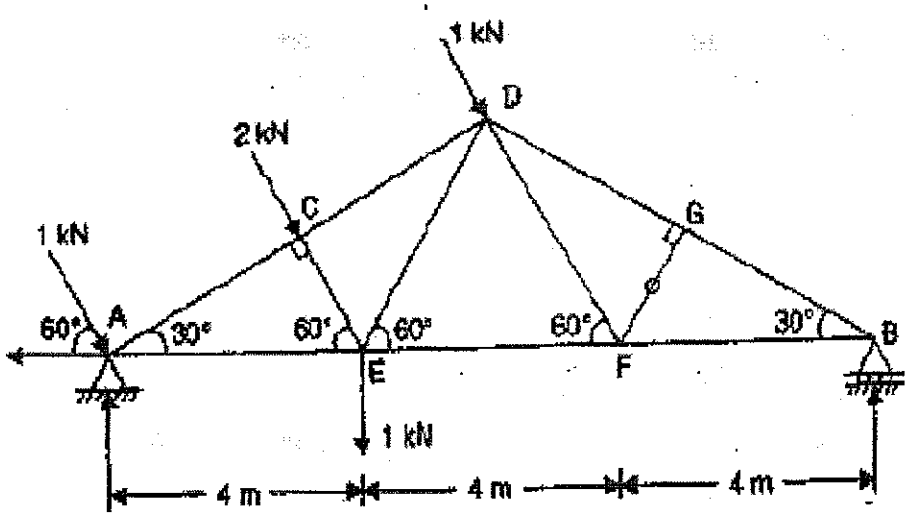

Figure 2

6. For the beam shown in Figure 3 show that the deflection at the free end is $WL^4/684EI$. Use Macaulay's method.

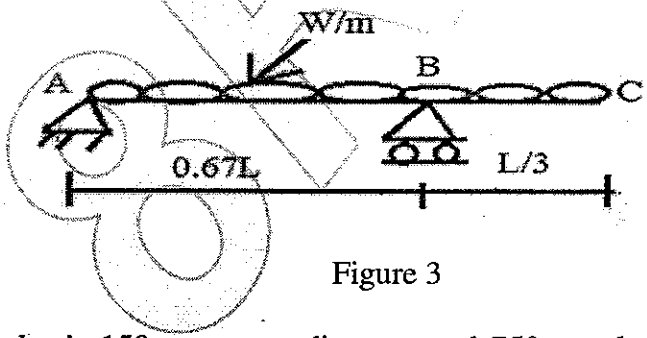

Figure 3

7.a) A thin cylinder is 150 mm mean diameter and 750 mm long with a wall 2 mm thick. It has an internal pressure of 0.8 MPa greater than the outside pressure. Calculate (i) circumferential strain, (ii) the longitudinal strain, (iii) change in cross sectional area (iv) change in length and (v) change in volume. Take E = 200 Gpa and poisons ratio = 0.25.

b) Differentiate between thick cylinders and thin cylinders and explain in detail.

8.a) What is the importance of wire winding of the cylinders? Explain the procedure to analyze them. What are the assumptions taken?

b) A thick cylindrical pipe of outside diameter 380 mm and internal diameter of 200 mm is subjected to an internal fluid pressure of 32 MPa and external fluid pressure of 8 MPa. Determine the hoop stress deyeloped and draw the variation of hoop stress and radial stress across the thickness.

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