Code No: 53016 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November - 2015
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. From fundamentals derive the relationship between three moduli of elasticity. [15]

2.a) Construct the shear force diagram and bending moment diagram for the beam shown in figure 1 and mark the values of important ordinates.

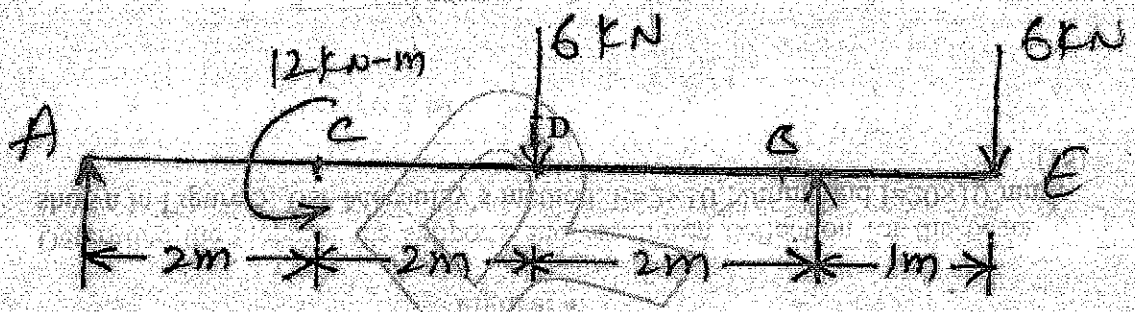

Figure: 1

b) For the beam shown in Figure 2, determine the value of x if the midpoint of the beam is a point of contra-flexure. For this arrangement draw the S. F and B. M diagram and locate any other point of inflexion. [7+8]

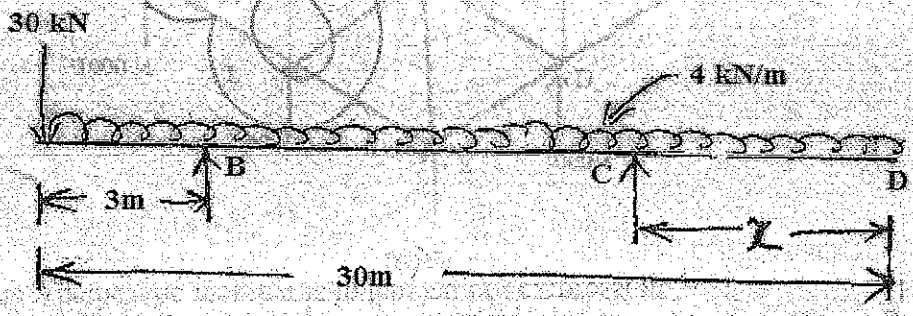

Figure: 2

3.a) State the assumptions of theory of simple bending and derive the bending equation:

$$\frac{\sigma}{y}=\frac{M}{I}=\frac{E}{R}$$

b) Calculate the maximum stress induced in a cast iron pipe of external diameter 40mm and internal diameter 20mm and of length 4 meters when the pipe is supported at its ends and carries a point load of 80N at it center. [6+9]

4. A 6m long beam (figure 3) with a 50 mm × 50 mm cross section is subjected to a loading of 5 kN/m. Find the maximum shear stress in the beam. [15]

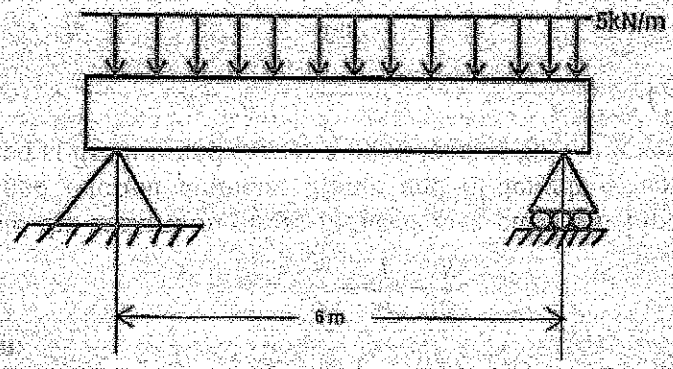

Figure: 3

5. Determine the force in member EB of the roof truss shown in the figure 4. Indicate whether the member is in tension or compression. [15]

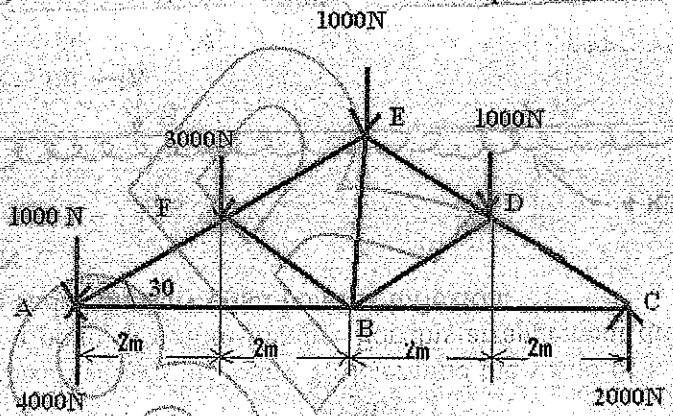

Figure: 4

6. Determine the slope at the supports and maximum deflection for the beam shown in Figure 5. Use Macaulay's method. E=2×10^5N/mm^2 and I=20×10^6mm^4. [15]

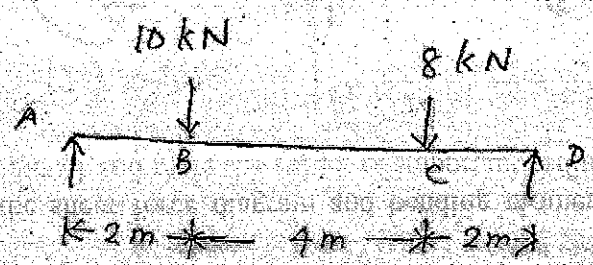

Figure: 5

7. A cylindrical shell 3 m long which is closed as the ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected dimensions of the shell, if it is subjected to an internal pressure of 1.5 N/mm^2. Take E = 2×10^5N/mm^2 and Poisson's ratio=0.3. [15]

8. Determine the maximum hoop stress across the section of a pipe of external diameter 400mm and internal diameter 100mm, when the pipe is subjected to an internal fluid pressure of 8 N/mm^2. [15]

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