Code No: 53016 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, May/June - 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.a) Draw stress - strain curve for a mild steel rod subjected to tension and explain about the salient points on it.

b) Derive a relation for change in length of a tapered bar hanging freely under its own weight. [7+8]

2.a) Derive the relationship between shear force, bending moment and rate of loading at a section of a beam.

b) A beam of length 12 m is simply supported at two supports which are 8 m apart, with an overhanging of 2 m on each side as shown in figure 1 below. The beam carries a concentrated load of 1000 N at each end. Draw SF and BM diagrams. [6+9]

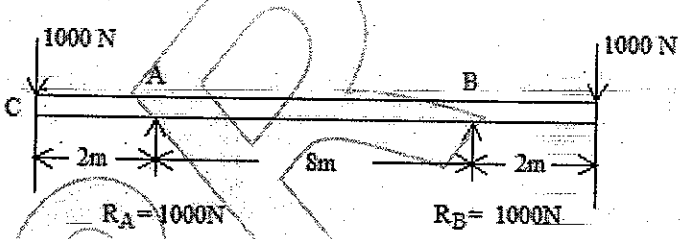

Figure: 1

3.a) State the assumptions of theory of simple bending.

b) Derive the bending equation: $\frac{\sigma}{y} = \frac{M}{T} = \frac{E}{R}$. [5+10]

4. An I-beam has flanges 10cm wide and 1cm thick and web 12cm high and 1cm thick. If this section is subjected to a bending moment of 10kNm and shearing force of 10kN, find the maximum tensile and shear stresses induced in it. [15]

5. Determine the force in member EB of the roof truss shown in the figure 2 below. Indicate whether the member is in tension or compression. [15]

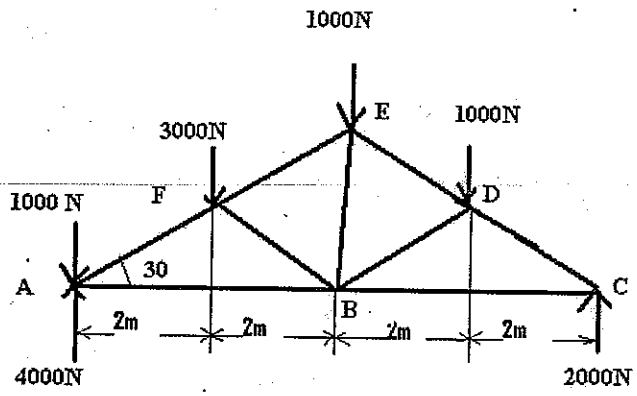

Figure: 2

6. Determine the slope at the supports and maximum deflection for the beam shown in figure 3 below. Use Macaulays method. $E=2\times10^5 N/mm^2$ and $I=20\times10^6 mm^4$. [15]

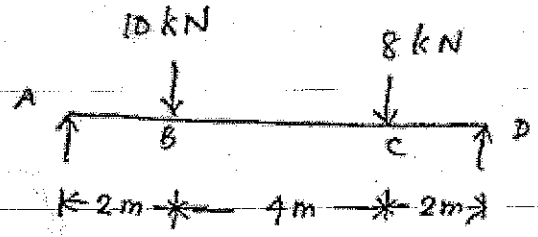

Figure: 3

7. A 2.4 m internal diameter and 6 m high vertical steam boiler is constructed with 20 mm thick plates for a working pressure of 1.1 N/mm^2. The end plates are flat and are not stayed. Calculate:
a) The stress in the circumferential plates due to resisting the bursting effect and the stress in the circumferential plate due to the pressure on the end plates.
b) The increase in length, diameter and volume. [7+8]

8.a) List out the assumptions made in the analysis of thick cylinder in deriving Lame's equations.

b) A thick cylinder of internal diameter 100 mm, external diameter 200 mm, is subjected to an internal pressure of 10 N/mm^2. Draw diagrams showing the distribution of radial pressure and hoop stress in the wall of the cylinder. [5+10]

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