R09

Code No: 09A30304

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, May/June-2013
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

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1. The following results were obtained in a tensile test of mild steel specimen of original diameter 20 mm and a gauge length of 40 mm. At the limit of proportionality the load was 80 kN and the extension was 0.048 mm. The specimen yielded at a load of 85 kN and the maximum load withstood was 150 kN. When the two broken parts were fitted together the length between the gauge markings was found to be 55.6 mm and the minimum diameter at the neck was 15.8 mm. Calculate
   i) Modulus of elasticity ii) Stress at the limit of proportionality
   iii) Yield stress iv) Ultimate stress
   v) % elongation in length vi) % reduction in area. [15]

2. Draw the shear force and bending moment diagram for the beam shown below figure 1. Take EI is constant and equal to 700 x 10^5 N-m^2. [15]

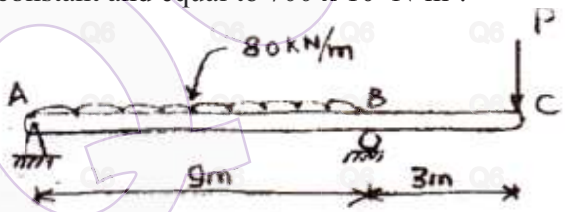

Figure: 1

3.a) A beam having the T-section as shown in figure 2 below is subjected to a bending moment of 24 kN-m about the horizontal axis. Find the maximum tensile and compressive bending stresses developed in the beam.

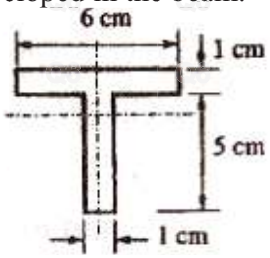

Figure: 2

b) Describe the assumptions used in bending theory of beams and derive beam equation. [15]

4.a) A timber beam 200 mm wide by 300 mm deep is used as simply supported beam on a span of 8 m. It is subjected to a concentrated load of 50 N at mid section of the span. If the plane of the load makes an angle of 45^0 with the vertical of symmetry find the direction of neutral axis and the maximum stress in the beam.

b) Explain the shear stress distribution along the axis of a circular beam. [15]

5. Calculate the forces acting the truss members BD and DE for the figure 3 shown below using method of joints and tension coefficient method. [15]

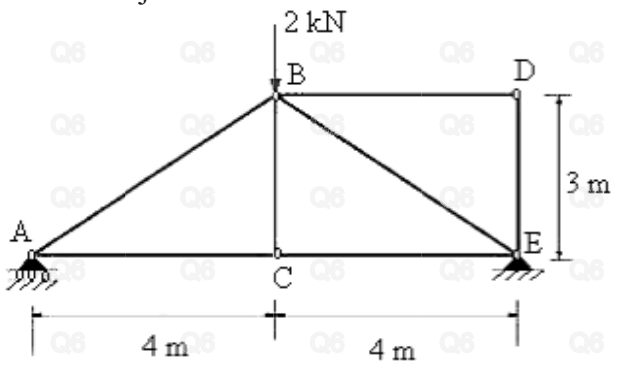

Figure: 3

6.a) Explain in detail Maxwell's theorem of reciprocal deflection.

b) Determine the maximum deflection and its location in the beam shown in Figure 4. The beam has a cross-section 50 mm wide and 150 mm deep. Take E=210 GPa. [15]

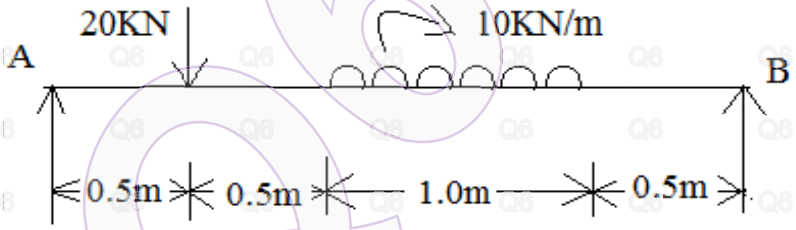

Figure: 4

7.a) A cylindrical tank is 2.25 m in diameter 3.5 m long and 5 mm thick. Find the increase in capacity when the pressure inside is 1.25 MPa with i) No axial compressive load on the tank ii) An axial compressive load of 450 kN. Find out the maximum shear stress to which the material of the cylinder is subjected in both cases.

b) A water main 100 cm diameter contains water at a pressure head of 450 m. If the density of water is 1000 kg/m^3, find the thickness of the metal required for the water main, given that the permissible stress is 20 MPa. [15]

8.a) What is the shrinkage required for composite cylinders? Explain.

b) A thick cylinder of 150 mm outside radius and 100 mm inside radius is subjected to an external pressure of 30 MN/m^2 and internal pressure of 60 MN/m^2. Calculate the maximum shear stress in the material of the cylinder at the inner radius. [15]

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