R09

Code No: 09A30304

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

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

Answer any five questions
All questions carry equal marks

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1. A bar of square cross section with 40 mm side and 3000 mm long is subjected to an axial force of 120 kN. Take Poisson's Ratio as 0.3 and Young's Modulus as 200 GPa. Calculate:
   a) The change in length and in the side due to applied load.
   b) The strain energy for the given loading.
   c) The Shear Modulus and the Bulk modulus.

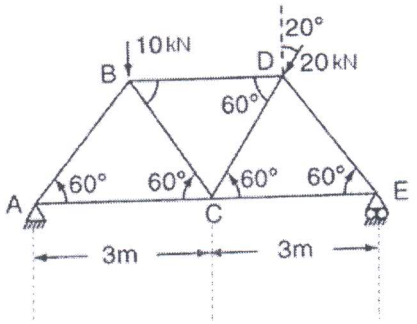
2. A simply supported beam AB, 10 m long carrying a point load 5 kN at 2.5 m from A and a point load 2.5 kN at 5 m from A and a uniform distributed load of 2 kN/m between the point loads. Determine the position and magnitude of maximum bending moment. Draw the shear force and bending moment diagrams.

3.a) Define the section modulus. Discuss the significance of section modulus in the design of beams.

b) A beam resting freely on supports 5 m apart carries a point load of 10 kN at the middle of the span. If the permissible stress in timber is 5 MPa, design a suitable section by making the depth equal to 1.8 times the width.

4. Derive the governing equation to find the shear stresses in beams. Develop a relation for the shear stresses across a rectangular section. Plot the shear stress distribution.

5. Find the forces in all the members of the truss as shown in the Figure using method of joints.



6. A beam of span 10 m is simply supported at the ends. It carries a uniformly distributed load of 6 kN/m for 5 m from left end and a concentrated load of 20 kN at 7 m from left end. Calculate the deflection of mid span and maximum deflection. Take E = 210 GPa and I = 80×10^6 m^4.

7. A cylindrical pressure vessel 2.5 m in diameter and 5 m long is made from 15 mm thick steel plate having a Young's modulus of 207 GPa and a Poisson's ratio of 0.28. Determine the longitudinal and circumferential strain if the cylinder is subjected to an internal pressure of 3.2 MPa. Also evaluate the change in length, change in diameter and change in volume.

8. A cylinder with external diameter 300 mm and internal diameter 200 mm is subjected to an internal pressure of 25 MPa. Compare the relative merits of a single thick walled cylinder and a composite cylinder with the inner cylinder whose internal and external diameters are 200mm and 250 mm respectively. A tube of 250 mm internal diameter and 300mm external diameter is shrunk on the main cylinder. The safe tensile yield stress of the material is 110 MPa and the stress set up at the junction due to shrinkage should not exceed 10 MPa.

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