PVP 12

Code: CE4T3

II B.Tech - II Semester – Regular Examinations - JUNE 2014

MECHANICS OF SOLIDS - II
(CIVIL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Derive the expression for circumferential stress and longitudinal stress for thin cylindrical shell subjected to internal pressure? 7 M

   b) Consider a closed cylindrical steel pressure vessel, radius of the cylinder is 1000 mm and having a wall thickness of 10 mm. (a) Determine the hoop and the longitudinal stresses in the cylindrical wall caused by an internal pressure of 0.80 MPa. (b) Calculate the change in diameter of the cylinder caused by pressurization. Let E = 200 GPa, and poisson ratio = 0.25. Assume that internal radius and outer radius near equal to same. 7 M

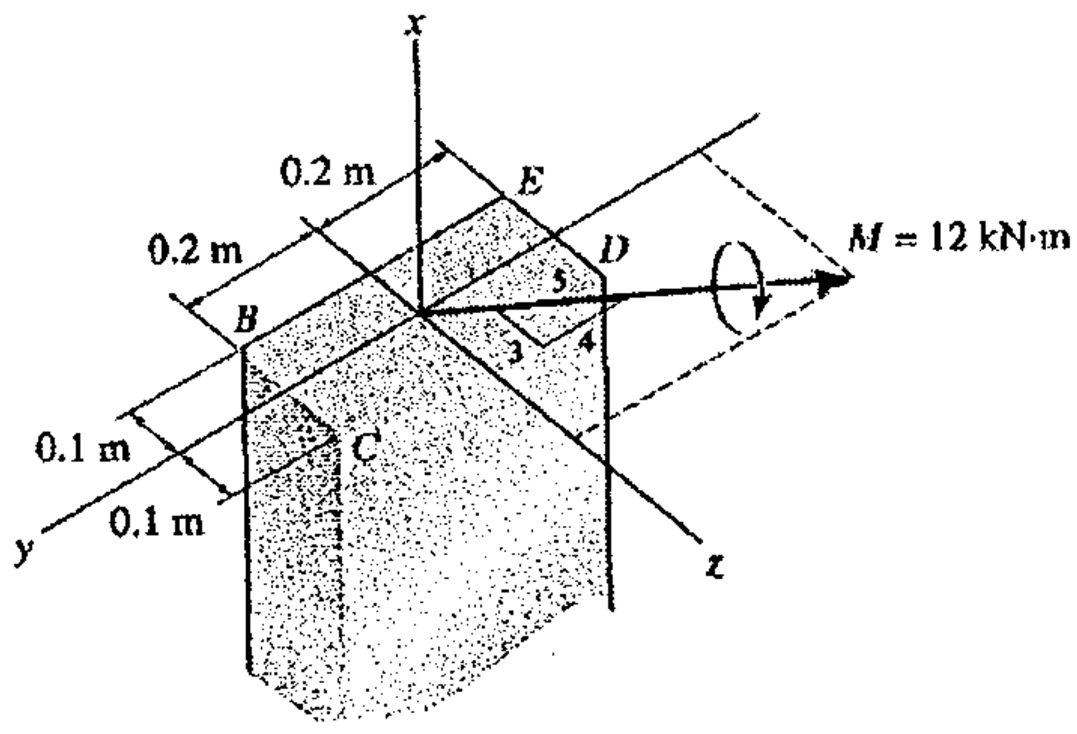
2. Find the thickness of the thick cylinder of a hydraulic ram of 50 mm internal diameter to withstand an internal pressure of 30 MPa. The allowable tensile stress is limited to 45 MPa and allowable shear stress to 40 MPa. 14 M

3. A close coiled helical spring made of 10 mm diameter steel bar has 8 coils of 150 mm mean diameter. Calculate the elongation, torsional stress and the strain energy per unit volume when the spring is subjected to an axial load of 130 N. Take G = 80 GPa. 14 M

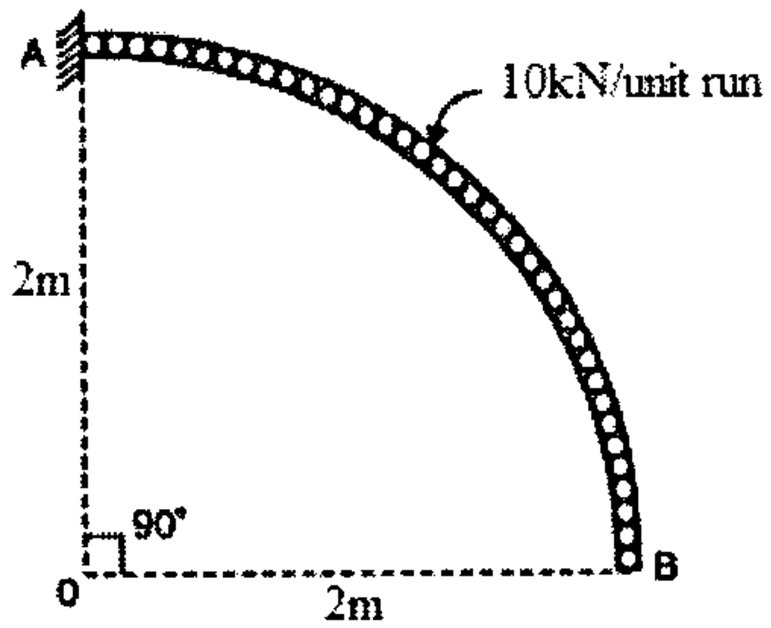
4. a) Using the Euler's formula, determine the critical stresses for a strut of slenderness ratio 120 under the condition of
   (i) both ends hinged and
   (ii) both ends fixed. E=205GPa. 7 M

   b) Two steel struts have the same cross sectional area. One is a solid one and the other is hollow with internal diameter three – fourth of the external diameter. Compare the ratio of the strength of the solid steel strut to that of the hollow one. 7 M

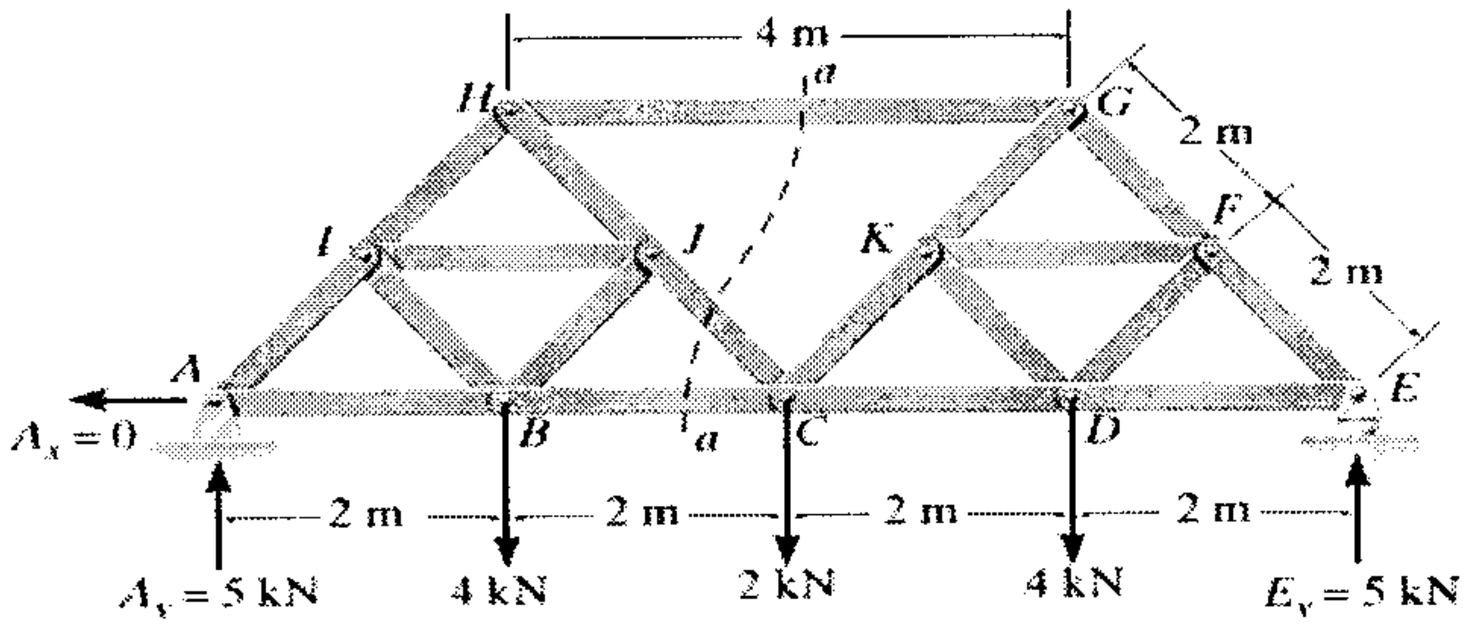
5. The rectangular cross section shown in fig. is subjected to a bending moment of M = 12 kNm. Determine the normal stress developed at each corner of the section, and specify the orientation of the neutral axis. 14 M



6. A curved beam AB of uniform cross section is horizontal in plan and in the form of a quadrant of a circle of radius 2m. The beam is fixed at A and free at B. It carries a uniformly distributed load of 10kN/unit run over the entire length of the beam, as shown in fig. calculate the shear force, bending moment and torsional values at A and B and sketch the variations of the same. 14 M



7. Determine the force in members HG, JC and BC of the truss shown in fig. State whether the members are in tension or compression. 14 M



8. A bolt is acted upon by an axial pull of 25 kN along with a transverse shear force of 10 kN. Determine the diameter of the bolt required according to (i) Maximum principal stress theory. (ii) Maximum shear stress theory. (iii) Maximum principle strain theory. (iv) Maximum strain energy theory. (v) Maximum shear strain energy theory. Elastic limit of the bolt material is 200 MPa and a factor of safety 2 is to be taken. Poisson's ratio is 0.2. 14 M