PVP 12

Code: CE4T3

II B.Tech - II Semester – Regular Examinations - JUNE 2015

MECHANICS OF SOLIDS-II
(CIVIL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. a) Derive an expression for the increase in the capacity of a thin cylindrical shell subjected to internal fluid pressure. 7 M

   b) A cylindrical pressure vessel of diameter 0.8 m and length 1.5 m is subjected to an internal pressure of 2 MPa. If the hoop stress is limited to 40 MPa and the longitudinal stress to 25 MPa, find the minimum thickness required. What will be the change in volume of the cylinder under this pressure? Take E = 200 GPa and ν = 0.25. 7 M

2. a) Show that the sum of radial and hoop stresses in a thick cylinder is constant. 7 M

   b) The maximum stress permitted in a thick cylinder of internal and external radii 200 mm and 300 mm respectively, is 16 MPa. Find the internal pressure that can be applied. What will be the change in thickness of the cylinder? E = 200 GPa and ν = 0.3 7 M

3. a) A close coiled helical spring has a mean diameter of 100 mm and18 coils of wire of diameter 10 mm. Find the maximum stress in the wire, increase in the number of turns and the total rotation when the coil is subjected to an axial twist of 1.2 Nm. E = 200 GPa. 7 M

b) An open coiled helical spring is made out of 15 mm diameter steel rod, the coils having 12 complete turns and a mean diameter of 100 mm, the angle of helix being 12°. Calculate the deflection under an axial load of 300 N and maximum intensities of direct and shear stresses induced in the section of the wire. 7 M

4. a) What is Euler's curve and what are the limitations of Euler's formula. 7 M

b) A steel pipe of outside diameter 20 mm and thickness 3 mm is deflected by 3 mm when used as a beam supported at its ends, 1 m apart, and subjected to a central load of 150 N. Find the buckling load when the pipe is used as a column with hinged ends. What is the maximum lateral deflection of this column before the material attains the yield stress of 250 N/mm^2. 7 M

5. A beam of rectangular section 80 mm wide and 120 mm deep is subjected to a bending moment of 12 kN-m. The trace of the plane of loading is inclined at 45° to the centroidal y axis of the section. Locate the neutral axis of

the section and calculate the maximum bending stress induced in the section. 14 M

6. A curved beam, circular in cross section is subjected to pure bending with couple of 300 N-m. The beam has a radius of 40 mm and is curved in a plane. The mean radius of the curve is 50 mm. Find the position of the neutral axis and the ratio of maximum to the minimum stress. 14 M

7. A truss is subjected to loading as shown in Figure 1. Determine the forces in the members BD, DF and BE.

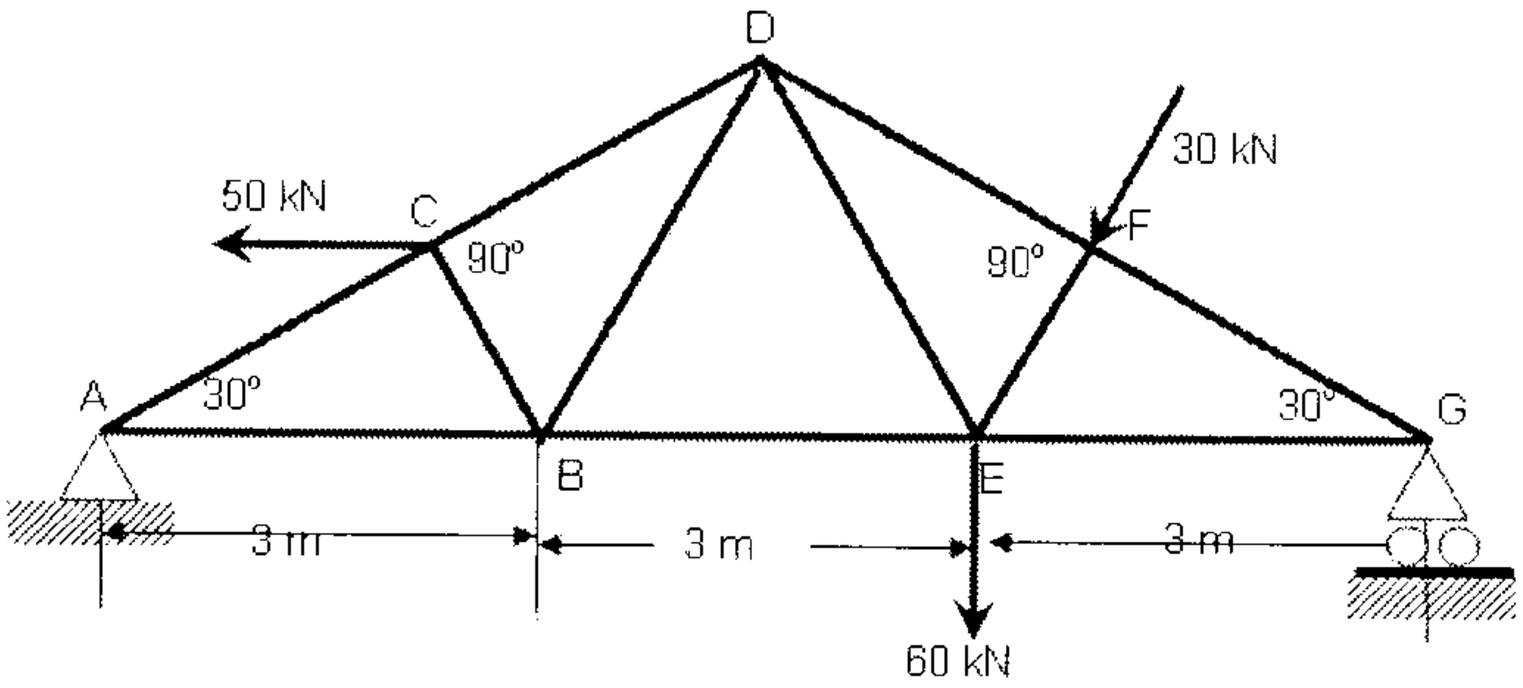

Figure 1

14 M

8. At a point in a stress material, the principal stresses are 180 N/mm^2 (Tensile), 90 N/mm^2 (tensile), and 40 N/mm^2 (compressive). Determine whether failure of the material will take place according to all the elastic failure theories. Take $\nu = 0.3$. Find the factor of safety in case the failure does not occur if the elastic limit stress in simple tension is 250 MPa. 14 M