PVP 12

Code: ME4T1

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

MECHANICS OF SOLIDS-II
(MECHANICAL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. Determine the slope and deflection under the 50 kN load for the beam loaded as shown in figure 1. Find also the position and magnitude of the maximum deflection. Take $E = 200\ GN/m^2$; $I = 83 \times 10^{-6}\ m^4$. 14 M

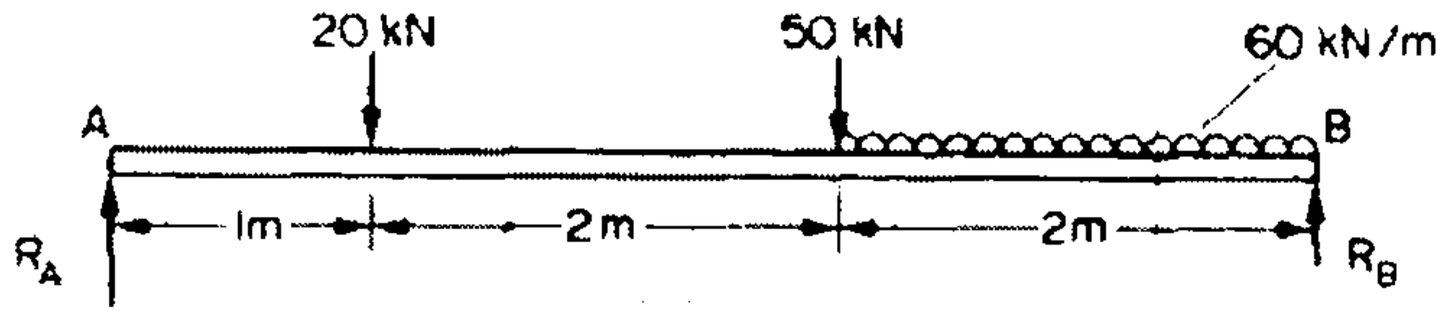

Figure 1

2. a) The statically indeterminate propped cantilever shown in Figure 2 is propped at B and carries a central load W. It can be assumed to have a constant flexural rigidity EI throughout. Determine the value of the reaction at the prop. 7 M

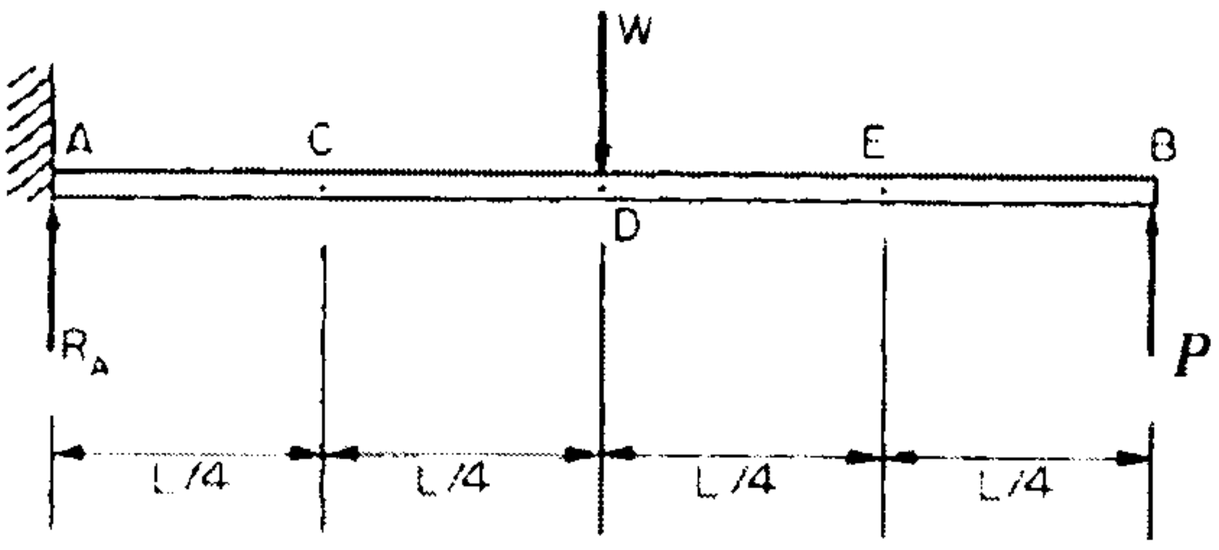

Figure 2

b) A cantilever, 2.6 m long, carrying a uniformly distributed load w along the entire length, is propped at its free end to the level of the fixed end. If the load on the prop is then 30 kN, calculate the value of w. 7 M

3. A continuous beam ABCD is simply supported over three spans AB = 1 m, BC = 2 m and CD = 2 m. The first span carries a central load of 20 kN and the third span a uniformly distributed load of 30 kN/m. The central span remains unloaded. Calculate the bending moments at B and C and draw the S.F. and B.M. diagrams. The supports remain at the same level when the beam is loaded. 14 M

4. A short length of tube, 4cm internal diameter and 5cm external diameter, failed in compression at a load of 240 kN. When a 2m length of the same tube was tested as a strut with fixed ends, the load at failure was 158kN. Assuming that the crushing stress in Rankine's formula is given by the first test, find the value of the constant a in the same formula. What will be the crippling load of this tube if it is used as a strut of 3m long with one end fixed and other end hinged? 14 M

5. A rectangular block of material is subjected to a tensile stress of 100 Mpa on one plane and tensile stress of 48 MPa on a plane at right angles, together with shear stresses of 65 MPa on the same plane. Find:
   a) The magnitude of principle stresses. 4 M
   b) Magnitude of greatest shear stress. 3 M

c) The direction of principle plane. 3 M

d) The normal and tangential stresses on a plane at 20° with the plane carrying greater stress. 4 M

6. A compound cylinder is made by shrinking a cylinder of external diameter 200mm and internal diameter 160mm over another cylinder of external diameter 160mm and internal diameter 120mm. The radial pressure at the junction after shrinking is 8 N/mm². Find the final stresses set up across the section, when the compound cylinder is subjected to an internal fluid pressure of 60 N/mm². 14 M

7. a) A rotating flat disc has 60mm inner diameter and 200mm outer diameter. If the maximum shearing stress in the disc is not to exceed 90 MPa, calculate the allowable speed in rpm. Take $\nu = 0.3$ and $\rho = 0.078$ N/cm^3. 7 M

b) A steam turbine rotor is running at 4800 rpm, it is to be designed for uniform strength of 90 MN/m². If the thickness of the rotor at the centre is 30mm and density of its material is 8000 kg/m³, find the thickness of the rotor at a radius of 400mm. 7 M

8. A curved bar is formed of a tube of 120 mm outside diameter and 7.5 mm Thickness. The centre line of this beam is a circular arc of radius 225 mm. A bending moment of 3 KNm tending to increase curvature of the bar is applied. Calculate the maximum tensile and compressive stresses set up in the bar. 14 M