SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :B.E - CIVIL
Title of the Paper :Mechanics of Solids – II Max. Marks :80
Sub. Code :6C0082 Time : 3 Hours
Date :26/04/2010 Session :FN

PART - A (10 x 2 = 20)

Answer ALL the Questions

1. What is a conjugate beam?
2. A steel cantilever beam of length 1m carries 1500 N point load at its free end. Find the maximum deflection assuming EI = 63000 N-m^2.
3. What is meant by crippling load of a column? On what factors does it depend?
4. What is a core of column section?
5. What is hoop stress?
6. What is shrinkage allowance in Compound cylinders?
7. What are principal planes?
8. State distortion energy theory.
9. What is meant by bending axis of a beam?
10. What is meant by the shear center of a beam?

PART – B (5 x 12 = 60)

Answer All the Questions

11. Determine the deflection at a point 1 m from the left-hand end of the beam loaded as shown in Figure 1 using Macaulay's method. Assume EI=65000 N-m^2.

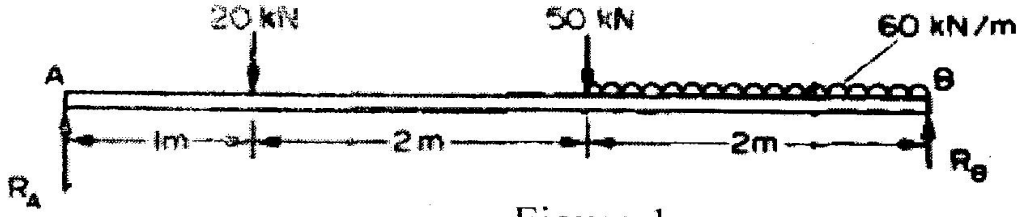

Figure 1

(or)

12. Determine the deflection and slope under the beam shown in Figure 2 by conjugate beam method. E=200GPa, I=15 x 10^{-4} m^4.

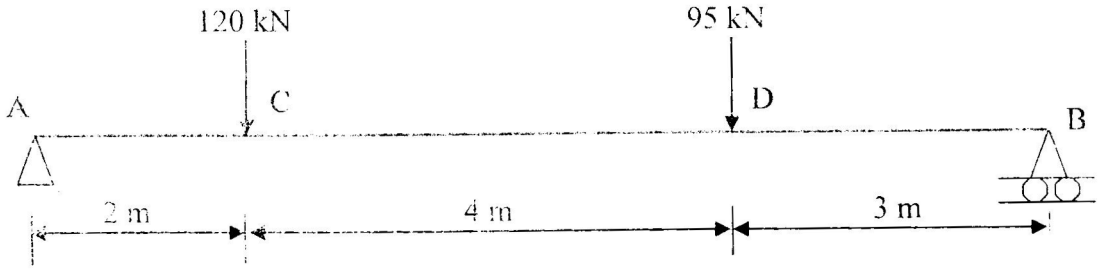

Figure 2

13. A steel column of circular section, 230 mm outside diameter and 23 mm thick is used as a column of 5 metres long. Both ends of the column are fixed. The column carries a load of 180 kN at an eccentricity of 27 m from the axis of the column. Find the extreme stresses on the column section. Find also the maximum eccentricity in order that there may be no tension anywhere on the section. Assume E=190 GPa.

(or)

14. A hollow circular Brass pipe with outside diameter 120 mm, thickness 6 mm and length 2.8 m is subjected to an axial load P applied 5 mm from its geometric axis. Assuming E=120 GPa, determine (a) the load p for which the horizontal deflection at the midpoint is 5mm, (b) the corresponding maximum stress in the column.

15. A cylinder with an internal diameter of 230 mm, has walls 5mm thick and is 1 m long. It is found to change in internal volume by 12 X 10^{-6} m^3 when filled with a liquid at a pressure p. If E= 200 GN/m^2 and v=0.25, and assuming rigid end plates, determine: (a) the values of hoop and longitudinal stresses; (b) the modifications to these values if joint efficiencies of 45% (hoop) and 85% (longitudinal are assumed; (c) the necessary change in pressure p to produce a further increase in internal volume of 15%. The liquid may be assumed incompressible.

(or)

16. An external pressure of 10 MN/m^2 is applied to a thick cylinder of internal diameter 160mm and external diameter 320 mm. If the maximum hoop stress permitted on the inside wall of the cylinder is limited to 30 MN/m^2, what maximum internal pressure can be applied assuming the cylinder has closed ends? What will be the change in outside diameter when this pressure is applied? E=207GPa, v=0.29.

17. For the state of stress given is Figure 3 determine (a) principal stresses (b) principal planes.

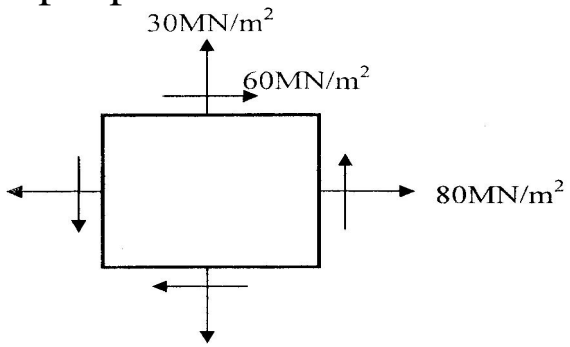

Figure 3

(or)

18. The 39 mm diameter shaft, shown in figure 4 is made of steel with yield strength σ_y=250MPa. Using maximum shearing criterion, determine the magnitude of the torque T for which yield occurs when P = 240kN.

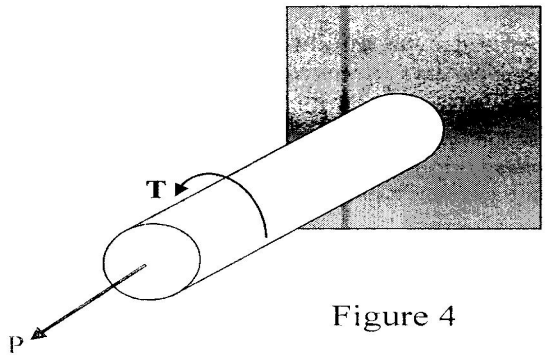

Figure 4

19. A Rectangular-section beam 80mm X 50 mm is arranged as a cantilever 1.3 m long and loaded at its free end with a load of 5 kN inclined at an angle of 30° to the vertical as shown if Figure 5. Determine the position and magnitude of the greatest tensile

stress in the section. What will be the vertical deflection at the end? E=210 GPa.

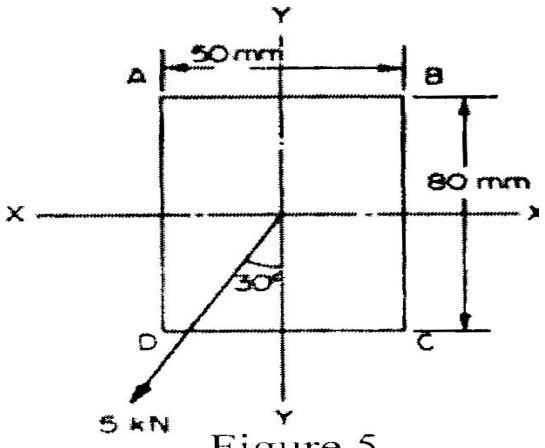

Figure 5

(or)

20. Determine the location of the shear center of a thin-walled beam of uniform thickness having the cross section shown in Figure 6.

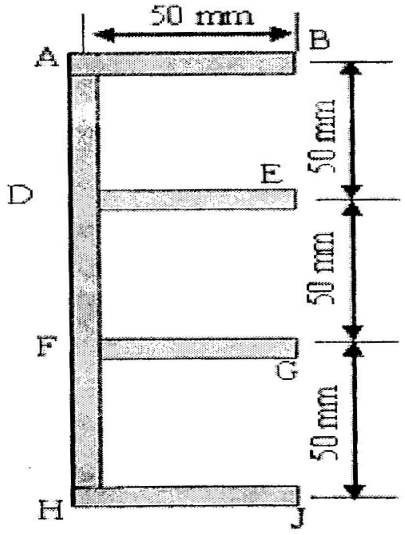

Figure 6