PVP 12

Code: **MEMD1T2**

I M.Tech-I Semester-Regular Examinations-April 2013

ADVANCED MECHANICS OF SOLIDS
(MACHINE DESIGN)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks
(Assume missing data)

1. Locate the shear center 'O' of the thin walled beam of uniform thickness having cross section as shown in fig. 1. 14M

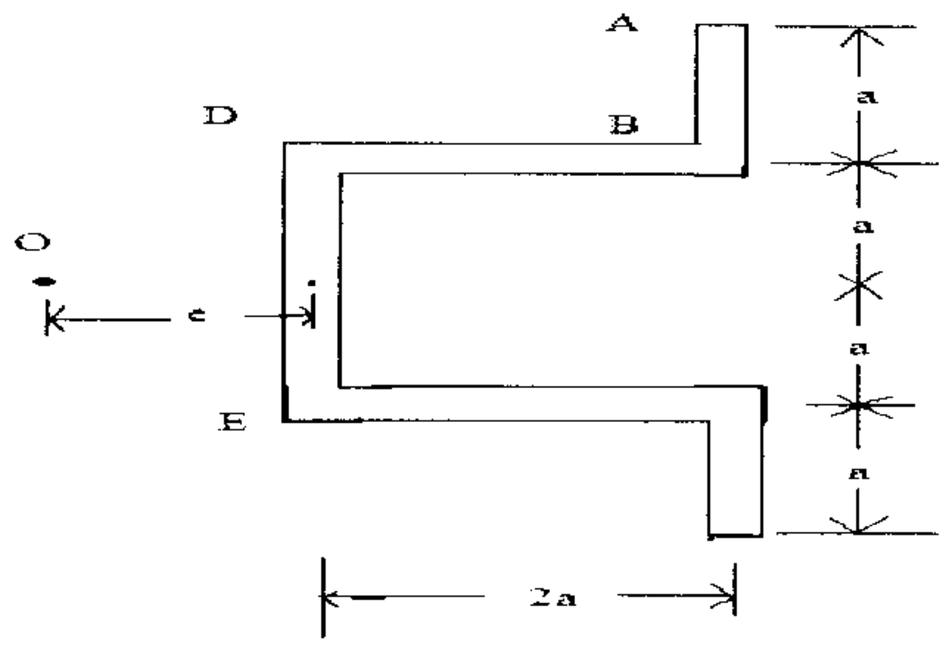

Fig.1

2. A beam 4.5m long is of rectangular section 15cm wide and 18cm deep. The beam is simply supported at each end and carries two concentrated loads of 3kN,each 1.5m apart from

each support. The plane of the load makes an angle of 30° to the vertical and passes through the centroid of the section. 14M

Determine:

(a) the bending stress due to the maximum bending moment at the center of the quadrant of the section in which the load is applied,

(b) direction of the neutral axis,

(c) deflection due to the load, and

(d) maximum tensile stress.

3. A T-section curved beam has the cross section shown in fig.2. The center of curvature lies 40mm from the flang. If the curved beam is subjected to a positive bending moment Mx=2.50kN-m, determine the stress at the inner and outer radii. Use the necessary correction factors. What is the maximum shearing stress in the curved beam? 14M

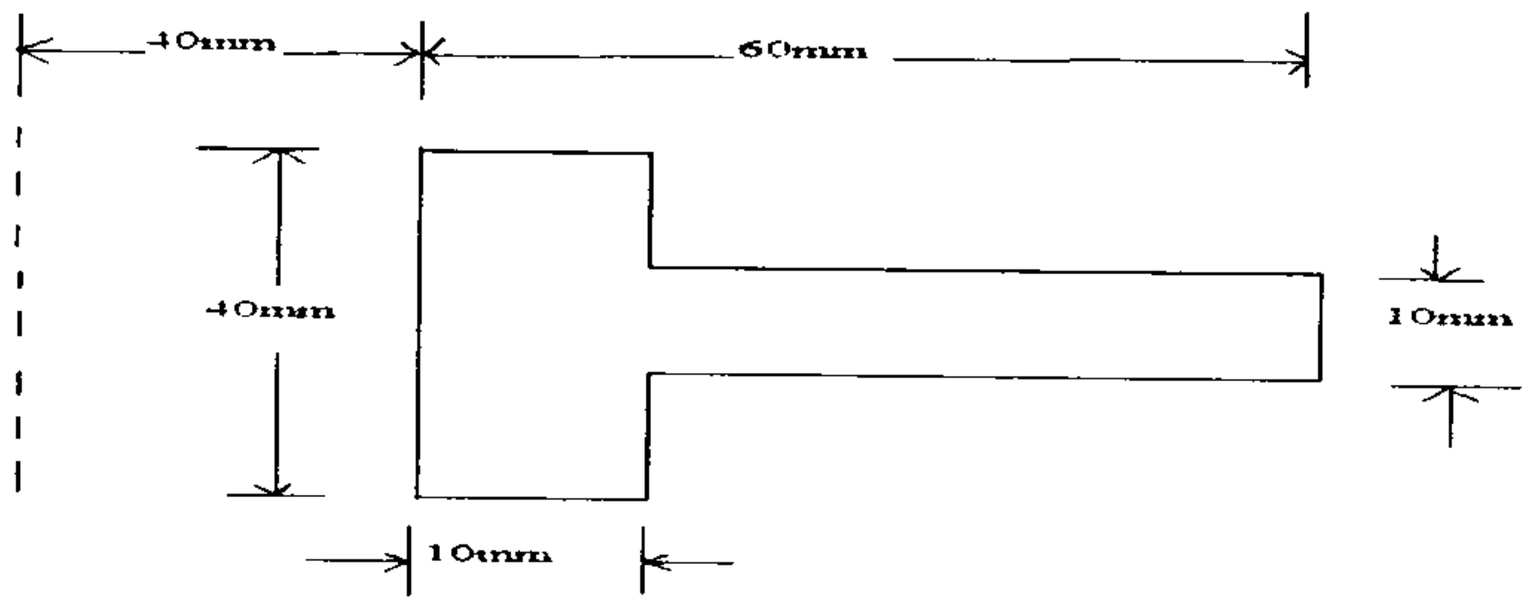

Fig.2

4. (a) Derive the expression for torsional resistance of a bar having elliptical cross section. 7M

   (b) A cantilever of elliptical cross section (15cm/10cm) is built in at one end and twisted by a couple of 50 KN-m applied at the other end. Calculate the angle of twist. Lenght of the shaft is 1.5m. 7M

5. A flat steel disc of uniform thickness and of 1m diameter rotates at 2400rpm.Determine the intensities of principle stresses. Take ρ=7.85*10^-5N/mm^3 and m=3.Solve the above problem if the disc has a central hole of 250mm diameter. 14M

6. (a) List the assumptions based on which the flat plate theory is developed initially. 7M

   (b) A cylinder 500mm internal diameter has a flat end 30mm thick. Find the greatest intensity of stress in the end if the

pressure in the cylinder is 1N/mm^2. The end may be taken as freely supported. Also find what intensity of simple direct stress would produce (i)the same maximum strain,(ii)the same maximum strain energy and (iii)the same maximum shear strain energy. Take m=3 7M

7. Explain with a suitable example, the analysis procedure for a finite beam on an elastic foundation. 14M

8. A cantilever beam of rectangular cross section carries a point load at the free end. Derive the expression to the stress components at any point in the cross section.

   Compare the result with those obtained from strength of materials. 14M