PVP 12

Code: **MEMD1T2**

I M.Tech - I Semester – Regular/Supplementary Examinations – January - 2017

ADVANCED MECHANICS OF SOLIDS
(MACHINE DESIGN)

Duration: 3 hours Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1. Locate the shear center for the beam cross section shown in Figure -1. The walls of the cross section have constant thickness t=2.5 mm. 14 M

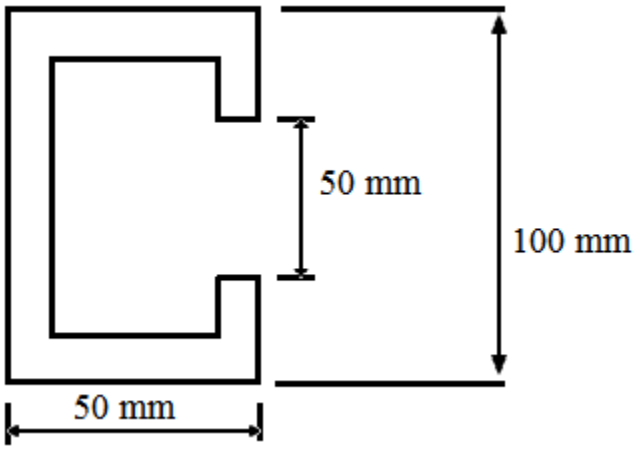

Figure – 1

2. Calculate the Maximum load which a simply support beam of T Section can carry at the centre. The Span of beam is 6m and dimensions to T section are shown in Figure-2. The load is inclined 30^0 to the Y axis and passes through centroid of T section. The maximum tensile stress and compressive

stress are not allowed to exceed 30N/mm^2 and 60N/mm^2 respectively. 14 M

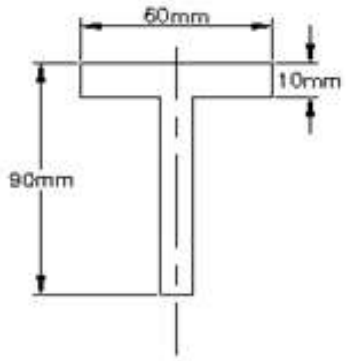

Figure – 2

3. A closed ring of mean radius of curvature 90 mm is subjected to a pull of 3kN. The line of action of load passes through the centre of the ring. Calculate the Maximum tensile and compressive stresses in the material of the ring, if the ring is circular in cross section with diameter equal to 15 mm. 14 M

4. a) A solid circular shaft transmit 73.56 kW at 200 r.p.m. Calculate the shaft diameter if the twist in the shaft is not exceed 1 degree in 2 m length of shaft and the shear stress is limited to 50MN/m^2. Take G = 100GN/m^2. 7 M

b) A shaft of square section is subjected to a torque of 1200 Nm, if the maximum shear stress is limited to 45 N/mm^2. Find the size of the shaft. Also find the angle of twist for a length of 2.75m. Take G = 8 x 10^9 N/mm^2. 7 M

5. a) A steel disc of uniform thickness and of diameter 900 mm is rotating about its axis at 3000 r.p.m. Determine the radial and circumferential stresses at the centre and outer radius. The density of material is 7800 kg/m^3 and Poisson's ratio = 0.3. 7 M

b) A steam turbine rotor is running at 4800 r.p.m. It is to be designed for uniform strength for a stress of 90 MN/m^2. If the thickness of rotor at the centre is 30mm and density of its material is 8000 kg/m^3, find the thickness of the rotor at the radius of 400 mm. 7 M

6. a) A rectangular plate of 0.5 m long, 0.25 m wide on 10 mm thick is simply supported at the edges. It carries a uniformly distributed load of intensity 2 MN/m^2 over the whole length. If E = 200 GPa and μ = 0.3. Calculate the maximum deflection and maximum stress. 7 M

b) A circular flat plate of 120 mm diameter and 6.35 mm thicknesses is clamped at the edges and subjected to uniform lateral pressure of 345 kN/m^2. Evaluate: 7 M

i) the central deflection,

ii) The position and Magnitude of the Maximum radial stress. If E = 200 GPa and μ = 0.3.

7. a) Derive the differential equation for the elastic line of a semi infinite beam resting on elastic foundation. 6 M

b) For a beam resting on an elastic foundation small $k = 14\ MN/m^2$, $E = 200\ GN/m^2$, $I = 3700 \times 10^{-8}\ m^4$. Three loads each equal to 125kNs acts on the beam spaced 2 m apart. Calculate the deflection and bending moment under the central load. 8 M

8. Given the Airy Function solutions to the following problems.
   a) bending of cantilever loaded at the end. 7 M
   b) bending of cantilever loaded by u.d.l throughout its length. 7 M