

Code: MEMD1T2

I M.Tech - I Semester - Regular Examinations – February-2016

**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 of the section shown in Figure-1.

14 M

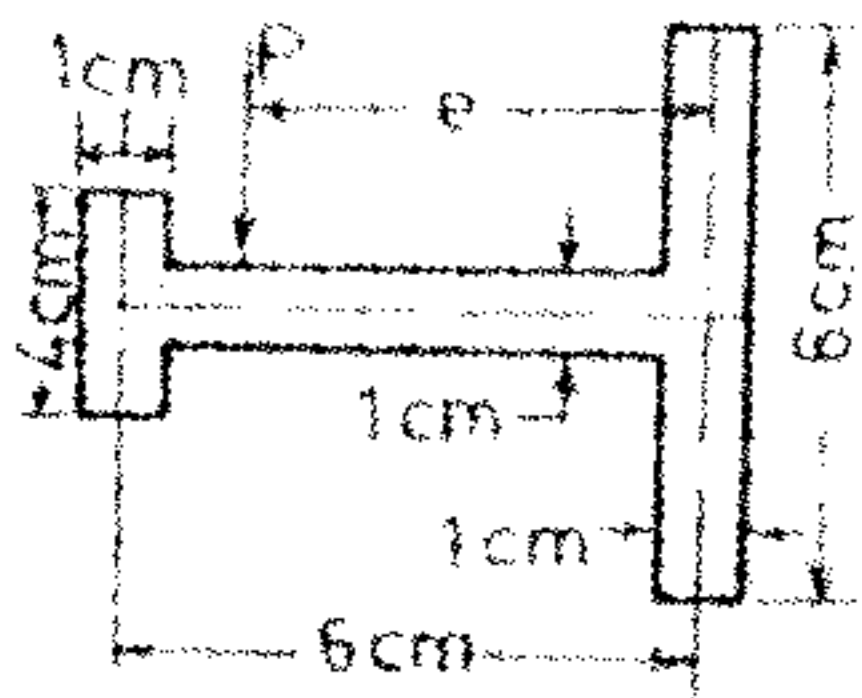


Figure-1

2. A wood beam of rectangular cross section 200mm/100mm is simply supported at its ends (Figure-2). Determine the location and magnitude of the maximum flexural stress in the beam.

14 M

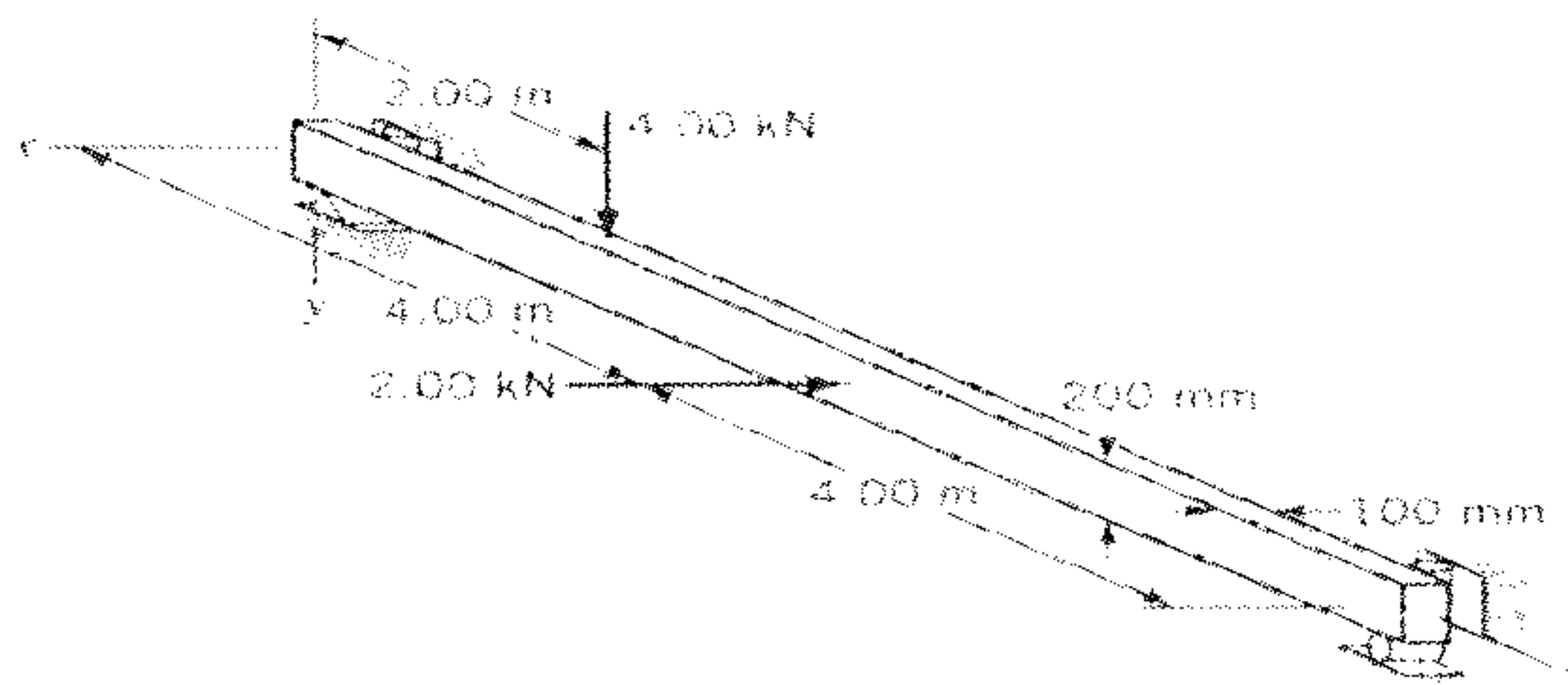


Figure-2

3. A load $P=12.0$ kN is applied to the clamp shown in Figure-3. Assuming that the curved beam formula is valid at that section, Determine the radial stress at the junction of the web and inner flange of the curved beam portion of the clamp. Neglect stress concentrations. 14 M

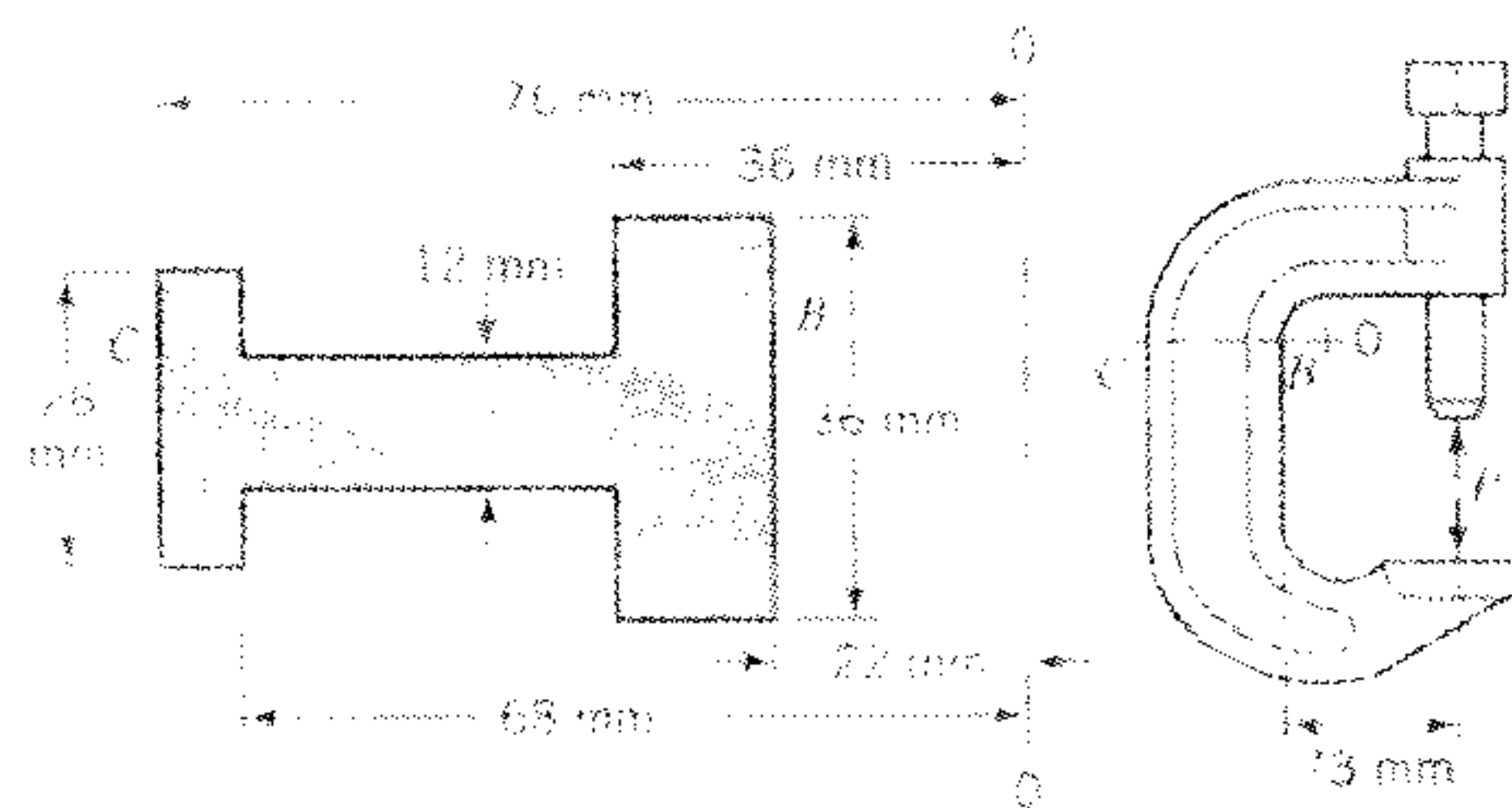


Figure-3

4. A square shaft has 42mm sides and the same cross sectional area as shafts having circular and equilateral triangular cross sections. If each shaft is subjected to a torque of 1 kNm, determine the maximum shear stress for each of the three shafts. 14 M
5. A hollow cylinder of 40cm external diameter and 20cm internal diameter is rotating at 3000rpm. Determine the distribution of radial and hoop stresses in the cylinder, density of cylinder material is 7800kg/m^3 , poisons ratio=0.3. 14 M
6. A square structural steel trap door ($E=200\text{GPa}$, $\nu=0.29$, and $Y=240\text{MPa}$) has a side length of 1.5 m and thickness of 15mm. The plate is simply supported and subjected to a

uniform pressure. Determine the yield pressure p_y and maximum deflection when this pressure is applied. 14 M

7. A four wheel car runs on steel rails ($E=200\text{GPa}$). The rails have a depth of 120 mm. The distance from the top of a rail to its centroid is 69mm, and its moment of inertia is $17.07 \times 10^6 \text{ mm}^4$. The rail rests on an elastic foundation with spring constant $k=12\text{N/mm}^2$. The two wheels on each side of the car are spaced 2.5m center to center. If each wheel load is 80kN, determine the maximum deflection and maximum flexural stress when a car wheel is located at one end of the rail and the other car wheel on the same rail is 2.5m from the end. 14 M

8. a) Explain significance of compatibility equations. 6 M
b) What is the stress function? Explain in detail. 6 M
c) What is a plane strain condition? 2 M