

I M.Tech - I Semester – Regular Examinations – February 2018**ADVANCED MECHANICS OF SOLIDS
(MACHINE DESIGN)**

Duration: 3 hours

Max. Marks: 60

Answer the following questions.

1. Determine the principal stresses and their axes for the state of stress characterized by the following stress matrix.

15 M

$$\sigma_{ij} = \begin{bmatrix} 18 & 0 & 24 \\ 0 & -50 & 0 \\ 24 & 0 & 32 \end{bmatrix}$$

OR

2. a) Explain Principal Strain Yield Criterion. State its drawbacks.

7 M

- b) Explain Von-mises yield criterion with relevant equations.

8 M

3. Locate the shear center for the beam cross section shown in Figure-1. The walls of the cross section have constant thickness, $t = 2.00$ mm.

15 M

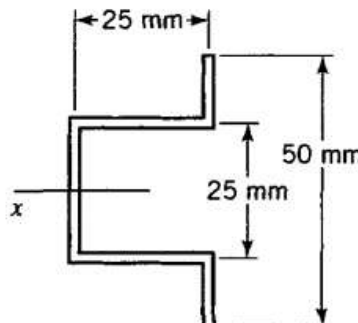


Figure-1

OR

4. A cantilever beam of rectangular section is subjected to a load of 1000 N, which is inclined at an angle of 30° to the vertical. What is the stress due to bending at point D (Figure-2) near the built-in-end? 15 M

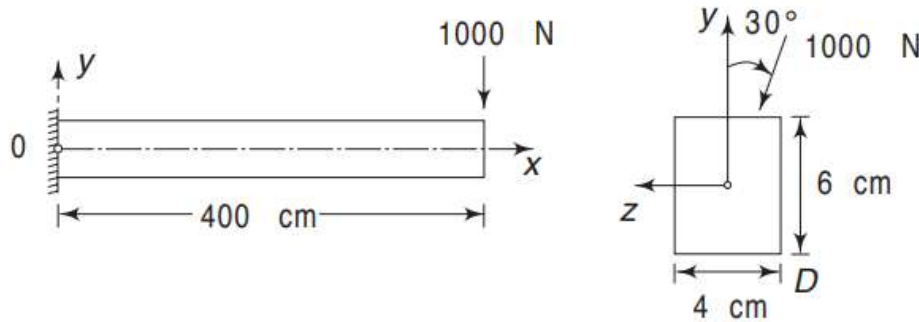


Figure- 2

5. The curved beam in Figure-3 has a circular cross section 50 mm in diameter. The inside diameter of the curved beam is 40 mm. Determine the stress at B and C for $P = 20$ kN. 15 M

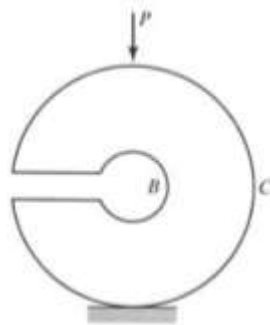


Figure-3

OR

6. Derive the equation for the circumferential stress acting on a rotating disk of uniform thickness with a hole in the middle. 15 M
7. Figure-4 shows a two-cell tubular section whose wall thicknesses are as shown. If the member is subjected to a

torque T , determine the shear flows and the angle of twist of the member per unit length. 15 M

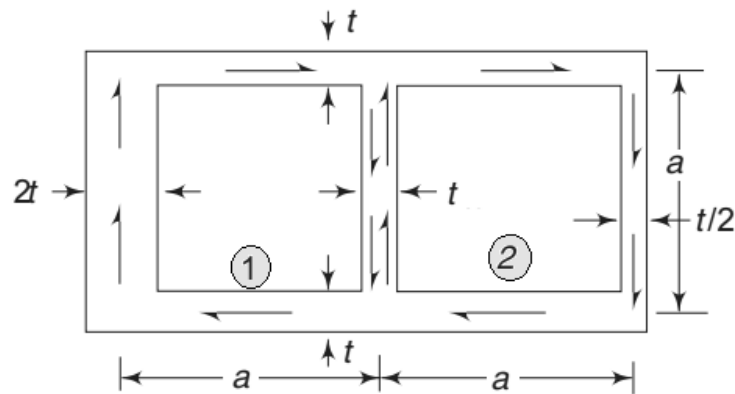


Figure-4

OR

8. The cantilever beam in Figure 5 has a rectangular cross section and is subjected to equal loads P at the free end and at the center as shown. Determine the deflection of the free end of the beam using Castigliano's theorem. 15 M

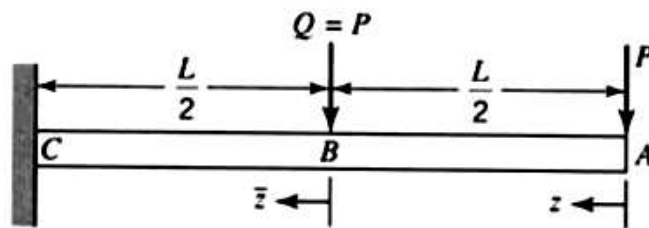


Figure-5