COURSE CODE: 12M1WCE211   MAX. MARKS:35

COURSE NAME: SOLID MECHANICS IN STRUCTURAL ENGINEERING

COURSE CREDITS: 03   MAX. TIME: 2 Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. All questions carry equal marks.

1. Describe Maxwell-Betti Rayleigh reciprocal theorem.

2. A thin circular ring of radius r is subjected to two diametrically opposite loads P in its own plane as shown in Figure 1. Obtain an expression for the bending moment at any section. Also, determine the change in the vertical diameter.
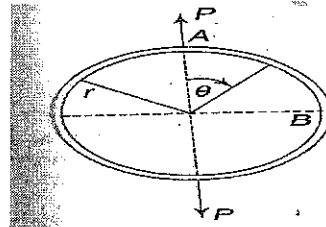

Figure 1

3. The following figure 2 shows a unsymmetrical one cell box beam with four corner flange members A, B, C, and D. Loads P_x and P_y are acting at a distance of 125 cm from the section ABCD. Determine the stresses in the flange members A and D. Assume that the sheet metal connecting the flange members does not carry any flexural loads.
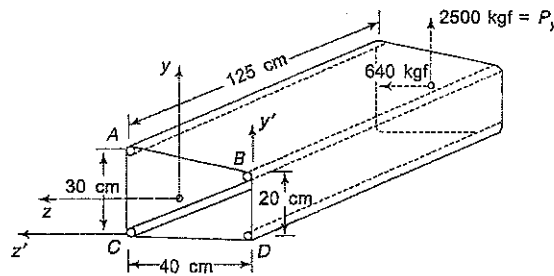

Figure 2

4. Define shear centre or centre of flexure? Derive the shear stresses in thin walled open sections.

5. Derive the expression for torsion of equilateral triangular bar.

6. Derive the case of plane stress and plane strain in axisymmetric problems.

7. Select the outer radius b for a cylinder subjected to an internal pressure $p = 500$ atm with a factor of safety 2. The yield point for the material (in tension as well as in compression) is $\sigma_{yp} = 5000$ kgf/cm^2. The inner radius is 5 cm. Assume that the ends of the cylinder are closed.