

Submission Date:

**ASSIGNMENT 4**

1. How will you *distinguish* between thin and thick pressure vessels?

A cylindrical pressure vessel of 500 mm diameter is subjected to an internal pressure of 9 MPa. Taking allowable stress for the material of the cylinder as 40 MPa, *estimate* i) wall thickness of cylinder, ii) circumferential stress at the outer surface and iii) percentage error involved when the thickness is calculated based on thin vessel theory.

2. A thin cylindrical vessel of 0.6 m diameter and 0.9 m long is subjected to an internal pressure of 1.2 N/mm<sup>2</sup>. Thickness of cylinder of wall is 15 mm. *Estimate* i) various stresses induced, and ii) change in diameter, length and volume. Take  $E = 200 \text{ GPa}$  and  $\nu = 0.3$ .

3. The diameter of a cylindrical vessel are 16 cm and 24 cm. *Estimate* the minimum and maximum hoop stresses due to internal pressure of 600 kN/cm<sup>2</sup>.

4. A close coiled helical spring is to be made of 5 mm diameter wire that is 2.0 m long so that it deflects by 20 mm under an axial load of 50 N. *Determine* mean diameter of coils. Assume  $G = 81 \text{ GN/m}^2$ .

5. A close coiled helical spring of 100 mm mean diameter is made of 10 mm diameter rod and has 20 turns. The spring carries an axial load of 200 N. *Estimate* the shearing stress. Assume  $G = 84 \text{ GN/m}^2$ , *determine* the deflection and strain energy, when carrying this load.

6. A carriage spring is to be 600 mm long and made of 9.5 mm thick steel plates and 50 mm broad. *How many* plates are required to carry a load of 4.5 kN, without the stress exceeding 230 MN/m<sup>2</sup>. *What* would be the central deflection and initial radius of curvature, if plates straighten under the load?  $E = 200 \text{ GN/m}^2$ .