**BBDNITM**

**MECHANICAL ENGG. DEPARTMENT**

**SESSION (2018-19)**

**Subject- Mechanics of Solids [RME303]**

**Assignment – 4**

1. What is the criterion to differentiate thick and thin cylinder?
2. Explain the different types of stresses in cylinder.
3. Derive the expression of the hoop stress for thin cylinder.
4. Prove that maximum shear stress at any point in a thin cylinder subjected to internal pressure is given by pd/8t.
5. A thin cylinder 75 mm internal diameter, 250 mm long with walls 2.5 mm thick is subjected to an internal pressure of 7 MN/m2. Determine the change in internal diameter and the change in length. If, in addition to the internal pressure, the cylinder is subjected to a torque of 200 N m, find the magnitude and nature of the principal stresses set up in the cylinder. E = 200 GN/m2. v = 0.3
6. A cylinder has an internal diameter of 230 mm, has walls 5 mm thick and is 1 m long. It is found to change in internal volume by 12.0 x10-6 m3 when filled with a liquid at a pressure p. If E = 200GN/m3 and v = 0.25, and assuming rigid end plates, determine:
   1. The values of hoop and longitudinal stresses;
   2. The modifications to these values if joint efficiencies of 45% (hoop) and 85%
   3. The necessary change in pressure p to produce a further increase in internal volume of (longitudinal) are assumed; 15 %. The liquid may be assumed incompressible
7. The internal and external diameter of a thick hollow cylinder is 80 mm and 120 mm respectively. It is subjected to an external pressure of 40 N/mm2 and an internal pressure of 120 N/mm2. Calculate the circumferential and radial stresses at the mean radius.
8. A cylinder has an internal radius of 200 mm and external radius of 300 mm. Permissible stress for the material is 15.5 N/mm2. If the cylinder is subjected to an external pressure of 4 N/mm2, find the internal pressure that can be applied.
9. A pipe with internal diameter 400 mm is to carry a fluid pressure of 12 MPa. If the maximum stress in the material of the pipe is restricted to 110 MPa, calculate the minimum thickness of the pipe required.
10. A pipe with internal diameter 400 mm is to carry a fluid at a pressure of 10 MPa. If the maximum stress in the material of the pipe is restricted to 150 MPa, calculate the minimum thickness of the pipe required.
11. A compound tube is composed of a tube 25 cm internal diameter and 2.5 cm thick shrunk on a tube of 25 cm external diameter and 2.5 cm thick. The radial pressure at the junction is 80 kg/cm2. The compound tube is subjected to an internal fluid pressure of 845 kg/cm2. Find the variation of the hoop stress over the wall of the compound tube.