



Mechanics of Materials-II

6th Semester---- (Session 2008)

Problem Sheet #5

- Pb.1** The cylinder of a hydraulic ram is 60mm internal diameter. Find the thickness required to withstand an internal pressure of 40Mpa, if the maximum tensile stress is limited to 60Mpa and the maximum shear stress to 50Mpa (Ans: 37mm)
- Pb.2** Find the ratio of thickness to internal diameter for a thick cylinder subjected to internal pressure when the ratio of pressure to maximum circumferential stress is 0.5.(Ans: 0.366)
- Pb.3** The cylinder of a hydraulic jack has a bore (internal diameter) of 150mm and is required to operate up to 13.8MPa. Determine the required wall thickness for a limiting tensile stress in the material of 41.4MPa. (Ans: 31mm)
- Pb.4** Determine the ‘k’ ratio for a thick-walled cylinder subjected to an internal pressure of 80MPa if the circumferential stress is not to exceed 140MPa. What are the maximum shear stresses at the inside and outside surfaces? (Ans: 1.915; 110MPa, 30MPa)
- Pb.5** A stainless-steel cylinder shell has a 1m inside diameter and is 13mm thick. If the tensile strength of the material is 550MPa and the factor of safety is 5, what is the allowable working pressure? (Ans: 2.86MPa)
- Pb.6** The maximum stress permitted in a thick cylinder, radii 80mm and 120mm, is 20MPa. The external pressure is 6MPa what internal pressure can be applied? Plot curves showing the variation of hoop and radial stresses through the material.
- Pb.7** A thick cylinder 200mm internal diameter is subjected to an internal pressure of 3.55MPa. If the allowable stress is 24MPa, find the thickness required. (Ans: 16.1mm)



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Pb.8 A thick-walled steel cylinder having an inside diameter of 150mm is to be subjected to an internal pressure of 40MPa. Find to the nearest mm the out side diameter required if the hoop tension in the cylinder wall is not to be exceed 125MPa. Find also the hoop stress at the outer surface of the cylinder. (Ans: 209mm, 85MPa)

Pb.9 An undersea research vehicle has a spherical pressure hull 1m radius and shell thickness of 34mm. the pressure hull is made of certain steel having yield point of 690MPa. Determine the depth of submergence that could set up the yield point stress in the spherical shell. Density of water is 1000Kg/m³. (Ans: 4782m)

Pb.10 A thick-walled steel cylinder of 75mm internal diameter is subjected to an external pressure of 42MPa. There is no internal pressure. Working stress of the material is 126MPa. Determine the required external diameter of the cylinder. (Ans: 130m)

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