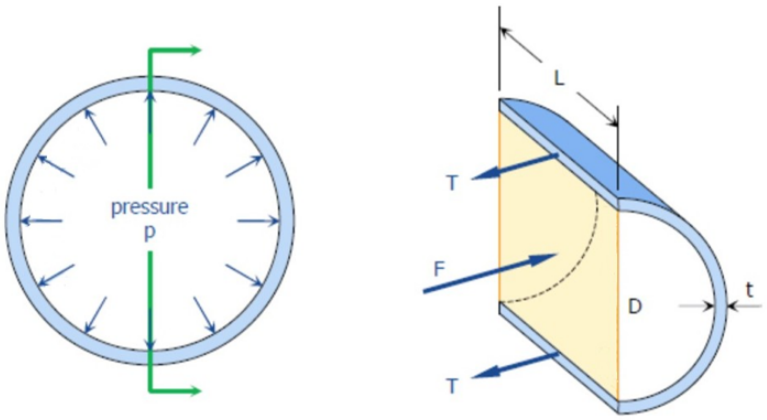
ME 7112: FINITE ELEMENT METHOD - Fall 2023

Assignment 7 (Due by 11:59 pm on 2023/12/11 Mon.)

Problem

Consider a thin-walled pressure vessel, as shown in the figure below. Assuming the material's Young's modulus is 200 GPa, Poisson's ratio is 0.3, the thickness of the vessel is 10 mm, the diameter is 50 cm, and the length is 1 m.



(a) Consider only the internal pressure of 1 MPa in the vessel. Derive the analytical solution for stress along the vessel wall direction and compare it with the results obtained from your own FEM code.

(b) If the container has an internal pressure of 1 MPa and an external pressure of 100 kPa, derive the analytical solution for stress along the vessel wall direction and compare it with the results obtained from your own FEM code.