

Problem Set #4 1.050 Solid Mechanics

Fall 2004

(Due Friday, 8 October)

Problem 4.1

A closed can of soda is under pressure equivalent to that in an automobile tire. We measured the wall thickness in lab on Thursday to be 0.0025 inches. Estimate the axial stress σ_a and the hoop stress σ_θ acting at a point in this closed, thin cylindrical shell, away from the ends.

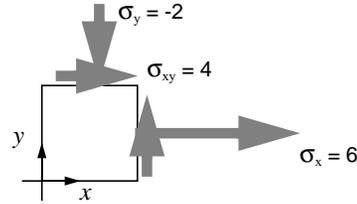
Problem 4.2

Given the components of stress relative to an x-y frame at a point in plane stress are:

$$\sigma_x = 6, \quad \sigma_{xy} = 4 \quad \sigma_y = -2$$

What are the components with respect to an axis system rotated 30 deg. counter clockwise at the point?

Determine the orientation of axis which yields maximum and minimum normal stress components. What are their values?



Problem 4.3

A thin walled glass tube of radius $R = 1$ inch, and wall thickness $t = 0.05$ inches, is closed at both ends and contains a fluid under pressure, $p = 80$ psi. A torque, M_t , of 300 inch-lbs, is applied about the axis of the tube.

Compute the stress components relative to a coordinate frame with its x axis in the direction of the tube's axis, its y axis circumferentially directed and tangent to the surface.

Determine the maximum tensile stress and the orientation of the plane upon which it acts.

Problem 4.4 (Potential Quiz Question).

Find the axial stress acting in member EF of the end-loaded truss if its cross-sectional area is 0.1 in^2 and $W = 1500 \text{ lb}$.

