**Homework 01**

1) A square prismatic bar of $1300\ mm^2$ cross-sectional area is composed of two pieces of wood glued together along the x' plane, which makes an angle θ with the axial direction. Assuming that the normal and shearing stresses acting simultaneously on the joint are 20 and 10 MPa, respectively, determine the applied axial load and the corresponding value of the angle θ. (**Ans**: $P = 32.5\ kN$)
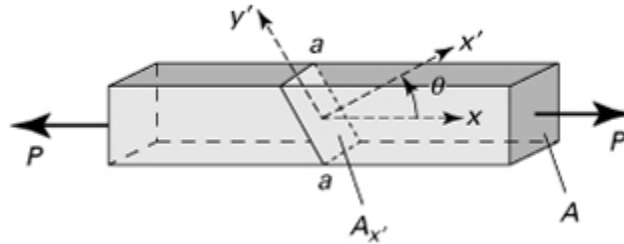

2) Given zero body forces, use the equilibrium equations to determine whether the following stress distribution can exist for a body in equilibrium

$$\sigma_x = -2c_1xy, \qquad \sigma_y = c_2z^2, \qquad \sigma_z = 0$$
$$\tau_{xy} = c_1(c_2 - y^2) + c_3xz, \qquad \tau_{xz} = -c_3y, \qquad \tau_{yz} = 0$$

Here the c's are non-zero constants.

3) At a point in a loaded machine, the normal and shear stresses have the magnitudes and directions acting on the inclined element shown. What are the stresses σ_x, σ_y, and τ_{xy} on an element whose sides are parallel to the xy axes? (**Ans**: $\sigma_y = -73.7\ MPa$)
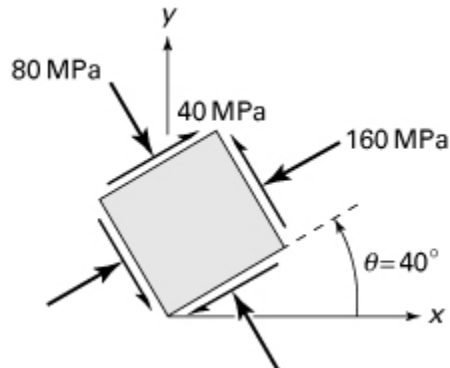
4) The cylindrical portion of a thin-walled, compressed-air tank is made of 5 mm-thick plate welded along a helix at an angle of $\varphi = 60°$ with the axial direction. The radius of the tank is $250\ mm$. If the allowable shearing stress parallel to the weld is 30 MPa, calculate the largest internal pressure p that may be applied. (**Ans**: $p = 2.77\ MPa$)