1. The 3-m long tee-shape beam shown below is supported at point B by an inclined strut connected at the centroid of the tee shape. The beam supports a uniformly distributed load of 1.25 kN/m.
   a. Determine the axial force, shear force, and bending moment at section a-a located 0.5 m to the right of support A. (10 points)
   b. The tee-beam cross-sectional dimensions are shown below. At section a-a, determine the normal stress and the transverse-shear stress at point H located 80 mm above the bottom of the stem. (10 points)
2. A uniform edge load of 500 lb/in. and 350 lb/in. will be applied to the polystyrene specimen as shown. Before the load is applied, the specimen is square with dimensions of \(a = 2\) in., \(b = 2\) in., and a thickness of \(t = 0.25\) in. Determine its new dimensions \(a', b',\) and \(t'\) after the edge load is applied. \(E_p = 597,000\) psi and \(\nu_p = 0.25.\) (10 points)

\(\text{(Hint: Use the edge load and the thickness } t \text{ to find the stresses } \sigma_x \text{ and } \sigma_y.\)
3. **Use Mohr’s circle for all portions** of the following problem. For the state of stress indicated on the stress element:
   a. Determine the principal stresses using Mohr’s circle. Show the results acting on a properly oriented stress element. (10 points)
   b. Determine the magnitude of the maximum in-plane shear stress and its associated normal stress (if any) using Mohr’s circle. Show this state of stress on a properly oriented stress element. (5 points)
   c. Using Mohr’s circle, determine the normal stress $\sigma_n$ and the shear stress $\tau_{nt}$ acting on plane a-a. (5 points)

(**Note:** You may wish to check your answers with the stress transformation equations, but your score will be based on your ability to produce the correct answers using Mohr’s circle. On page 4 of this exam, draw the rotated element, sketch the stresses acting on the element, and indicate the angle relative to the x axis for each part of this question.)