1. The clamp has been tightened until the clamping force on the two boards is 90 lbs. Determine the normal stress acting (a) at point a on the inside of the clamp and (b) at point b on the outside of the clamp. (10 points)
2. An old warehouse is to be rehabilitated for commercial usage. The existing Douglas fir timber beams in the warehouse are 8-in. wide and 18-in. deep. To increase the load carrying capacity of these beams, a 6-in. wide by ¼-in. thick carbon fiber reinforced plastic (CFRP) plate will be bonded to the bottom surface of the timber beam. The moduli of elasticity for the timber and the CFRP are 1,700 ksi and 23,800 ksi, respectively. The allowable normal stresses of the timber and the CFRP are 1,200 psi and 175,000 psi, respectively.

a. Determine the allowable moment capacity of the existing timber 8 × 18-inch beams. (10 points)

b. Determine the allowable moment capacity of the timber beam reinforced with the CFRP plate. (20 points)
3. A steel T-shape is used to support the horizontal loads shown on the diagram. **Please note the x, y, and z axes shown on the figures. Pay particular attention to these axes with respect to section properties.**

   a. About which axis will bending occur? (5 points)
   b. Consider the entire 22-ft length of the beam and determine the maximum tension stress at any point along the beam. State where this stress occurs (i.e., point A, B, C, or D). (10 points)
   c. Consider the entire 22-ft length of the beam and determine the maximum compression stress at any point along the beam. State where this stress occurs (i.e., point A, B, C, or D). (10 points)

![Diagram of a steel T-shape beam with loads and section properties.](image)

- **I_Z = 62.27 in^4**
- **I_Y = 7.48 in^4**

Write legibly – box answers
Include proper units
4. For the beam and loading shown, consider section $n-n$ and determine the shearing stress at point b. (10 points)