

1. As shown in Fig. 1, the solid shaft is fixed to the support at  $C$  and subjected to the torsional loadings shown.
  - (a) Determine the shear stress at points  $A$  and  $B$ . (20%)
  - (b) Sketch the shear stress on volume elements located at these points (10%).

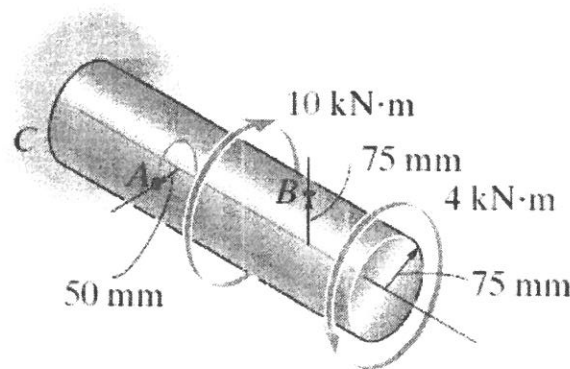


Fig. 1

2. As shown in Fig. 2, the clamp is made from members  $AB$  and  $AC$ , which are pin connected at  $A$ . If it exerts a compressive force at  $C$  and  $B$  of 180 N. The screw  $EF$  is subjected only to a tensile force along its axis.
  - (a) Determine the maximum compressive stress in the clamp at section  $a-a$ . (15%)
  - (b) Sketch the stress distribution acting over section  $a-a$ . (5%)

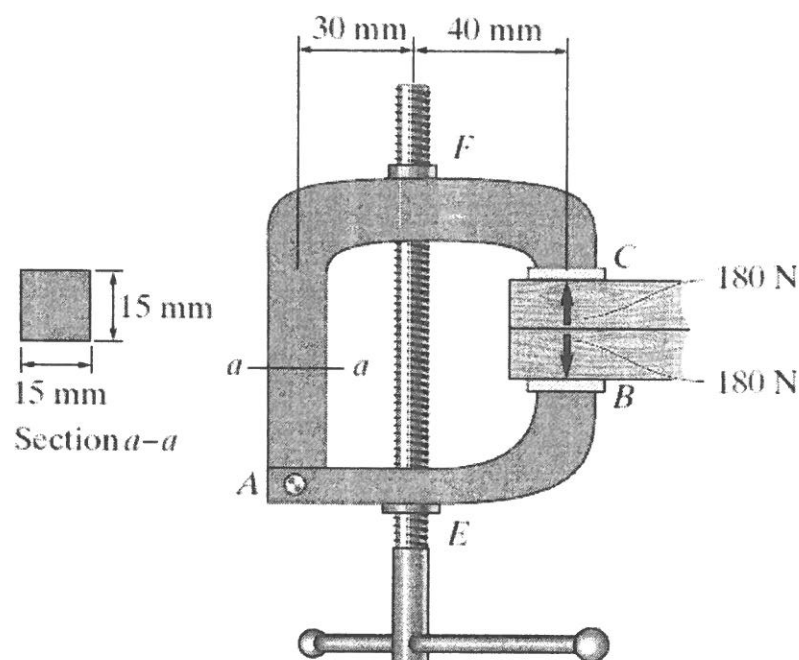


Fig. 2

3. The state of plane stress at a point is shown on the element in Fig. 3. Using Mohr's stress circle to determine the answer for following problems,
- Represent this state of stress on an element oriented 30 degree counterclockwise from the position shown. (13 %)
  - Determine the principal stresses, the maximum in-plane shear stress, and average normal stress. (12 %)

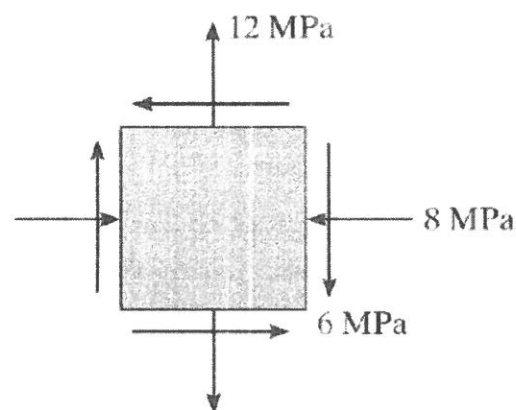


Fig. 3

4. If  $P = 3600$  N, determine the minimum dimension  $a$  of the beam's cross section to the nearest integer mm to safely support the load. The wood species has an allowable normal stress of  $\sigma_{\text{allow}} = 10.5$  MPa and an allowable shear stress of  $\tau_{\text{allow}} = 1.05$  MPa. (25 %)

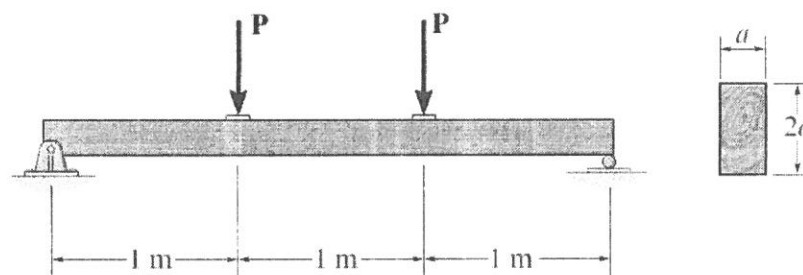


Fig. 4