

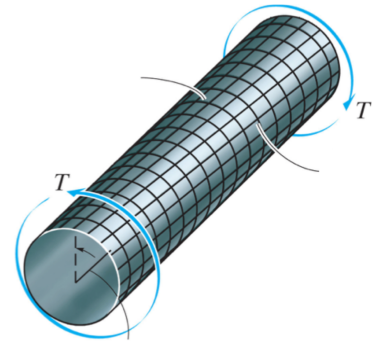
**Q1A**

For a curved beam, which on of the following statements is not true (incorrect):

- A. The normal strain varies linearly with depth
- B. The neutral axis in does not pass through the centroid of the cross section
- C. Plane section remains plane
- D. In-plane distortion within cross section is negligible+

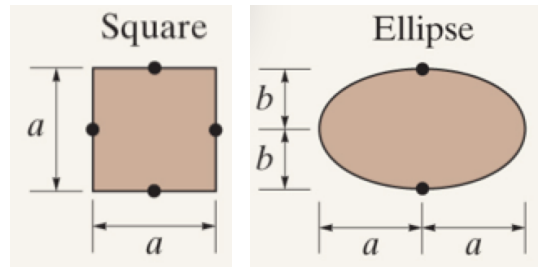
**Q1B**

As shown in the adjacent figure, when torsion is applied to a circular section, the longitudinal lines become twisted after deformation. Does the cross section remain plane? True (T) or False (F)?



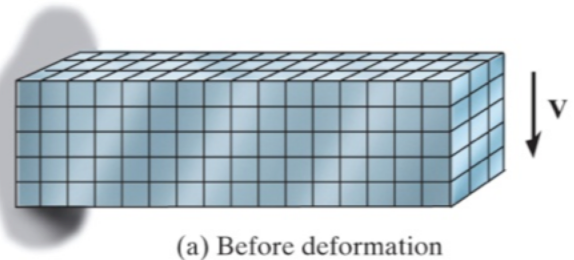
**Q1C**

A solid square and elliptical cross section are subject to the same torque ( $T$ ). The ellipse has the dimensions of  $a = 3b$ . In comparison with the square section using the dimension,  $a$ , what section has the lowest shear stress? Square (S) or Ellipse (E)?



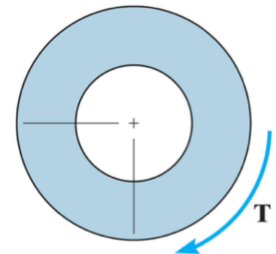
**Q1D**

For any arbitrary beam section, does the shear force cause warping of the cross section? True or False?



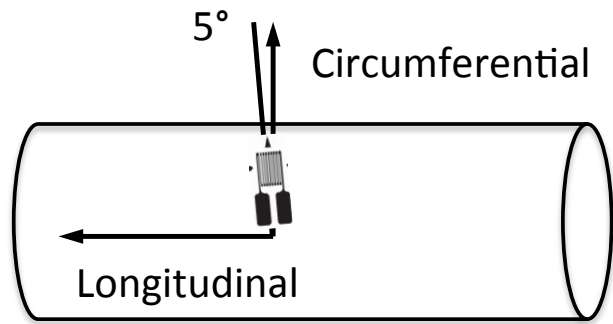
**Q1E**

For the hollow section shown subject to an applied torque ( $T$ ). At what location or position is the shear stress a minimum?

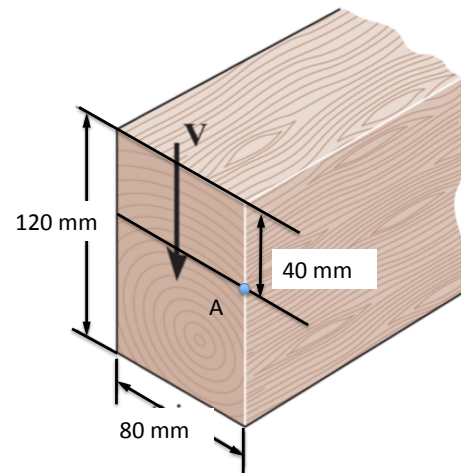


**Q1F**

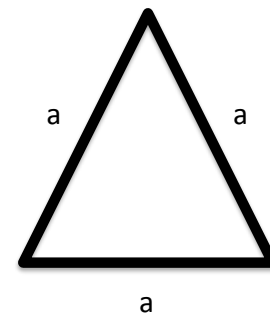
A bar has a strain gauge attached to measure the circumferential strain. The strain gauge was not placed correctly with a  $5^\circ$  misalignment to the circumferential axis. If the circumferential axis is the  $x'$  axis then what is the normal strain along this strain gauge direction? Use 2 significant figures only.

**Q1G**

Find  $Q_A = \bar{y}A'$  for the section shown at point A.

**Q1H**

For the thin-walled equilateral triangular section, with sides ( $a = 100$  mm measured to mid-wall position) and thickness ( $t = 4$  mm) calculate the term  $\oint_s \frac{ds}{t}$ .



Quiz #1

CIVE 3202 Solid Mech II

Q1A A

Q1B TRUE

Q1C  $\tau_c = \frac{4.81T}{a^3}$

$$\tau_c = \frac{2T}{\pi ab^2} = \frac{2T}{\pi a \left(\frac{a}{3}\right)^2} = \frac{18T}{\pi a^3} = \frac{5.7T}{a^3}$$

$\therefore$  SQUARE

Q1D TRUE

Q1E INSIDE RADIUS

Q1F  $\epsilon_{x'} = \epsilon_x \cos^2 \theta + \epsilon_y \sin^2 \theta + \gamma_{xy} \sin \theta \cos \theta$

$$\epsilon_{x'} = 0.99\epsilon_x + 0.0076\epsilon_y + 0.087\gamma_{xy}$$

$\therefore$  0.99

Q1G  $Q = j'A' = (20\text{mm} + 20\text{mm})(40\text{mm})(80\text{mm})$

$$Q = (40\text{mm})(40\text{mm})(80\text{mm}) = 128000\text{mm}^3$$

Q1H  $\oint \frac{ds}{t} = \frac{3a}{t} = \frac{3(100\text{mm})}{4\text{mm}} = 75$