

- As shown in Fig.1, a shaft is made from a steel tube (Young's modulus  $E_S$  and shear modulus  $G_S$ ) and a brass core (Young's modulus  $E_B$  and shear modulus  $G_B$ ). The shaft has one end ( $B$ ) fixed on the wall. A uniformly distributed torque of  $T_o$  is applied to the shaft from position  $x=L/2$  to  $x=L$ . Please determine the twist angle at end  $A$ . (25%)

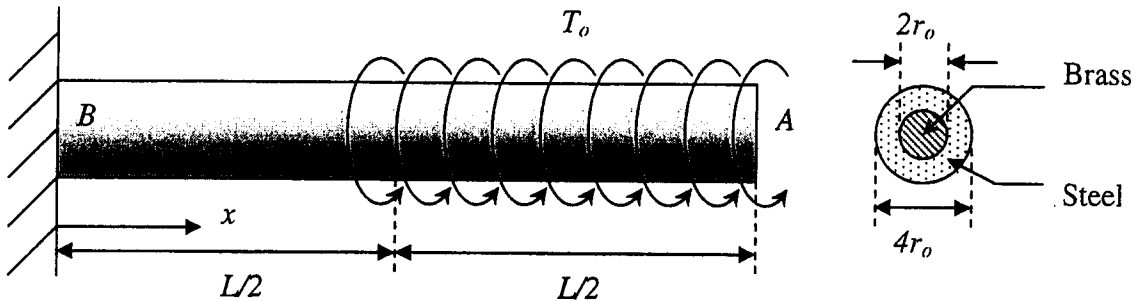


Fig.1

- The resultant moment acting on the cross section of a steel strut has a magnitude of  $M = 800 \text{ N}\cdot\text{m}$  and is directed as shown in Fig.2, where  $C$  is the centroid of the cross section. Determine the maximum bending stress in the strut. (25%)

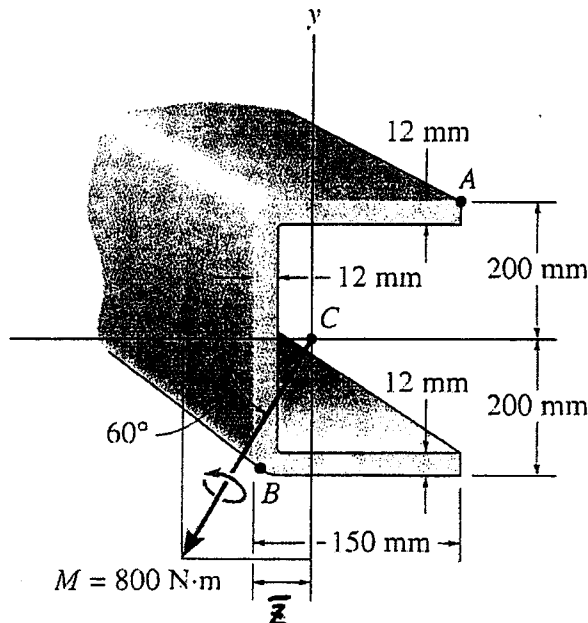


Fig.2

(背面仍有題目,請繼續作答)

3. A strain gauge is placed on the surface of a thin-walled steel boiler as shown in Fig.3. It is 0.5 cm long. If the strain gauge is elongated by  $0.2 \times 10^{-3}$  cm, please determine (a) the internal pressure in the boiler, and (b) the maximum x-y in-plane shear strain in the material. The boiler has a thickness of 0.5 cm and inner diameter of 60 cm. The Young's modulus and Poisson's ratio are 200 GPa and 0.3, respectively. (25%)

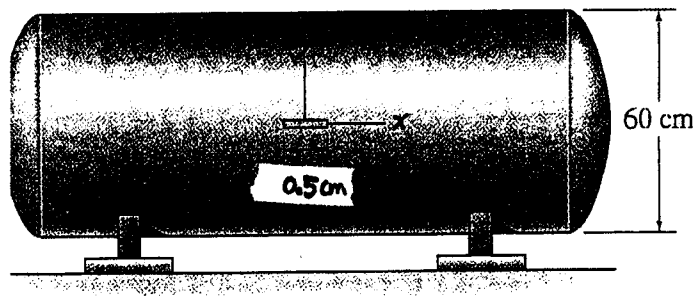


Fig.3

4. (a). Explain what is the "shear center" of a thin-walled member. (b). Determine and plot the location of the shear center for the thin-walled member having a cross section shown in Fig.4. (25%)

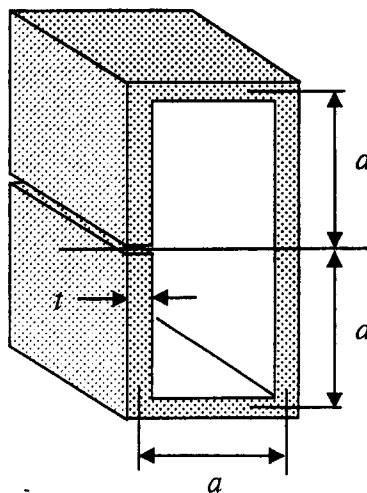


Fig.4