(25pt)

(Prob. 1) A 9-mm-diameter brass rod *AB* is attached to the base of a cylindrical brass vessel *CD*, the cross-sectional area of which is 300 mm^2. Vessel *CD* is attached to a fixed support at *C*, and a plug *E* is attached to end *A* of the rod. Knowing that the modulus of elasticity of brass is 85 GPa, determine the magnitude of **P** for which the deflection of the plug is 1.2 mm downward.

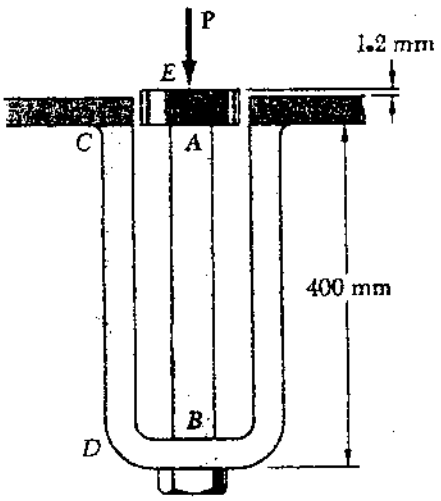

Fig. Prob. 1

(25 Pt)

(Prob. 2) Determine the location and the value of the maximum stress in each of the two machine elements shown.

(Notes: ① moment of Inertia
$I = \frac{1}{12} b h^3$
② Use Figs. Prob 2(B) and (C) to compute the stress.)

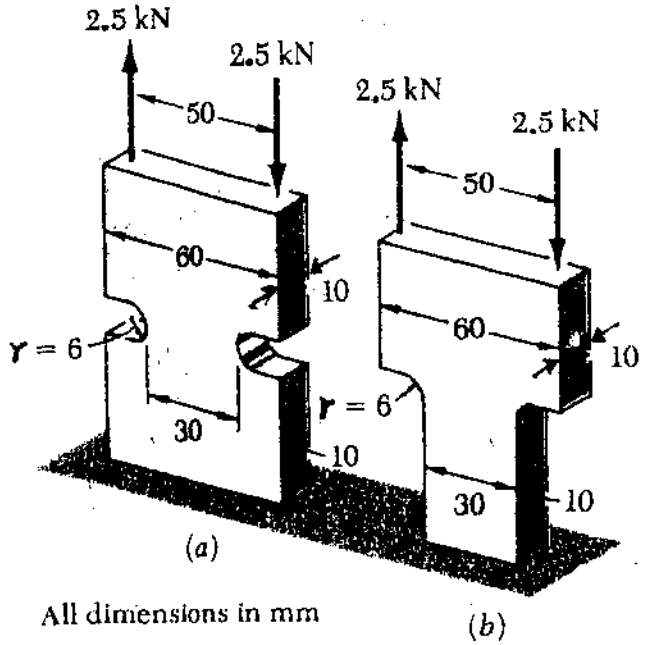

Fig. Prob. 2(A)

Figs Prob. 2(B) and (C), see next page.

(背面仍有題目,請繼續作答)

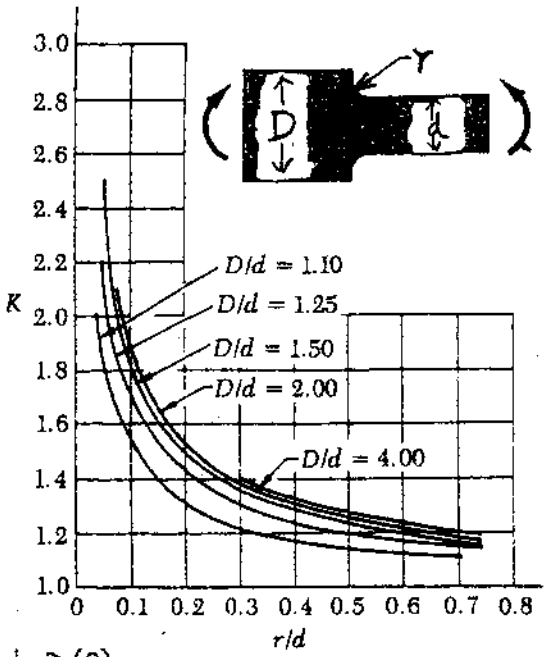

Fig. Prob. 2 (B) Stress-concentration factors for *flat bars with fillets under pure bending.*†

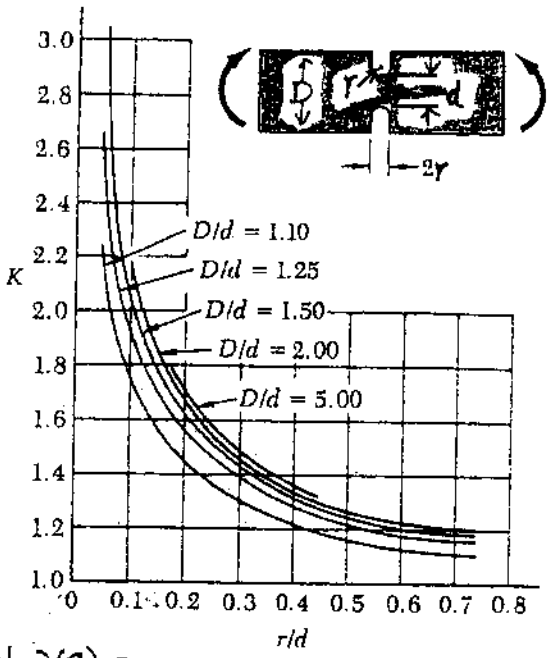

Fig. Prob. 2 (C) Stress-concentration factors for *flat bars with grooves under pure bending.*†

(Prob. 3)

(25pt) (A) Using the concept of "Transformation of Plane Strain" to prove the following relation under small strain condition:

$$\varepsilon(\theta) = \varepsilon_x \cos^2\theta + \varepsilon_y \sin^2\theta + \gamma_{xy} \sin\theta \cos\theta$$

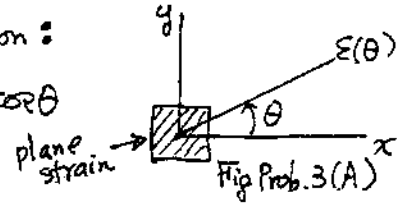

Fig Prob. 3(A)

(25pt) (B) A single strain gage forming an angle of 60° with a horizontal plane must be used to determine the torque T transmitted by a solid 90-mm-diameter steel shaft. Knowing that for the steel used $G = 75$ GPa, determine the torque indicated by a gage reading of 250 μ.

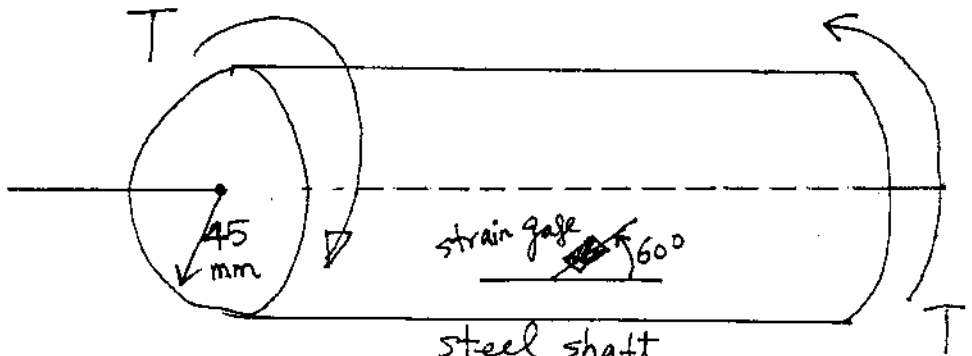

Fig. Prob. 3 (B)