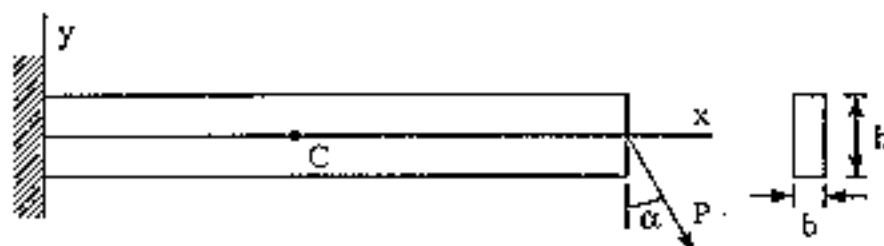
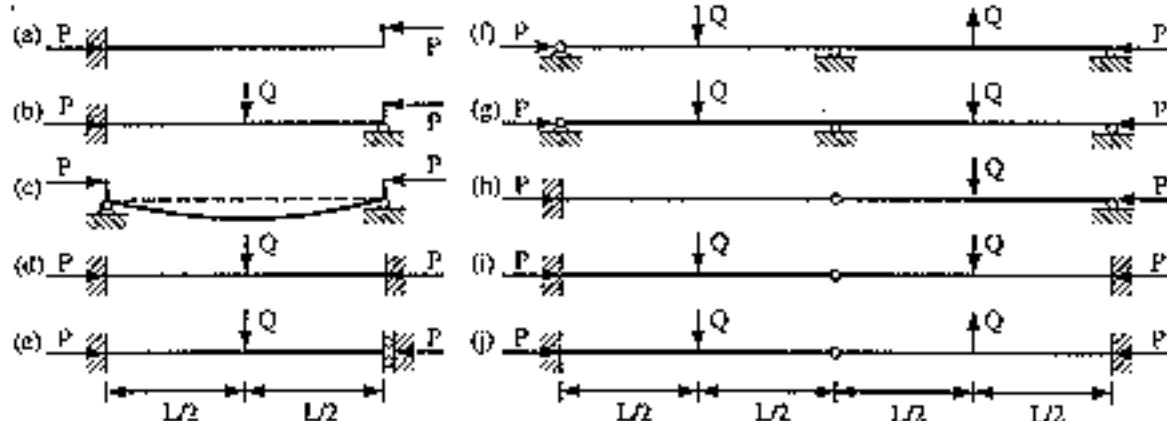


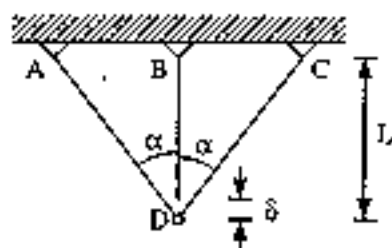
1. A cantilever beam of rectangular cross section (width $b = 25 \text{ mm}$, height $h = 100 \text{ mm}$) is loaded by a force P that acts at the midheight of the beam and is inclined at an angle α to the vertical. If the strains at point C (the midheight of the beam) are $\epsilon_x = 125 \times 10^{-6}$ and $\gamma_{xy} = -866 \times 10^{-6}$. Assume that the material is steel with $E = 200 \text{ GPa}$ and $\nu = 1/3$. Determine: (i) the force P and the angle α , (ii) ϵ_y at C , (iii) the maximum and minimum principal stresses at C . (20%)



2. What are the critical buckling loads P_{cr} for the following columns. Assume all columns have the same EI and $Q = 0.1P$. Note: You are not supposed to carry out a lot of calculations. (20%)

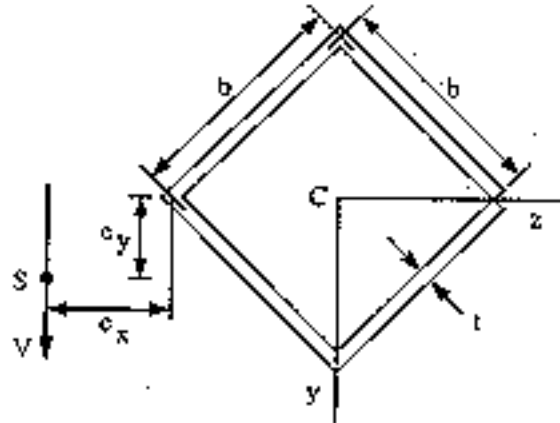


3. Member BD of a three-bar truss is shorter than the design length L by an amount δ . All bars have the same cross section area A and are made up of the same material with a nonlinear stress-strain relation as $\sigma = K\sqrt{\epsilon}$. If the truss is forced to be assembled, use the complementary energy theorem (Crotti-Engesser theorem) to calculate the axial forces in all bars. (20%)



(背面仍有題目,請繼續作答)

4. A cross section of a slit square tube of constant thickness t is shown in the figure. Determine the distances e_x and e_y to locate the shear center S . (20%)



5. A circular bar AB is made up of three materials perfectly bonded together as shown in the figure. The shear moduli and polar moments of inertia of these three materials are G_1 , G_2 , G_3 and I_{p1} , I_{p2} , I_{p3} respectively. The bar is fixed at end A and subjected to a concentrated torque T at end B. Assume that $G_1 I_{p1} = 2G_2 I_{p2} = 4G_3 I_{p3}$. Calculate: (i) the torque applied to each material, (ii) the angle of twist at point B. (20%)

