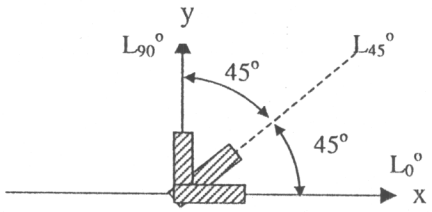
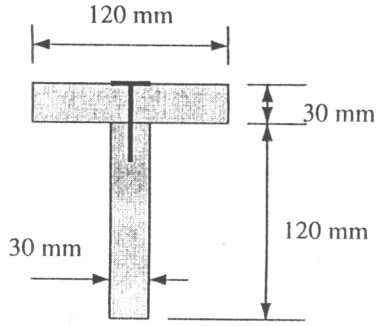
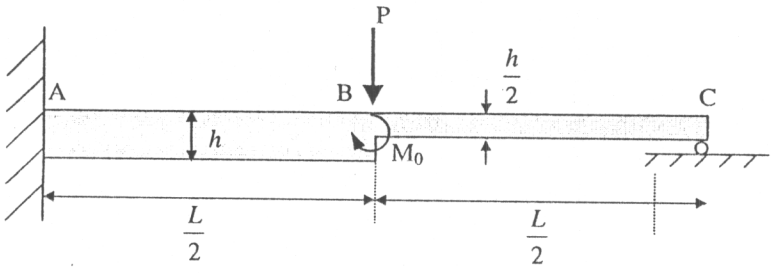
1. As shown in the figure, a strain gage rosette is bonded to a free surface for measuring relative elongation along three different directions, 0°, 45°, and 90°. If the measured elongation along the three directions are, $L_0° = -0.003$, $L_{45°} = 0.003$, and $L_{90°} = 0.006$, please determine the shear strain component γ_{xy}. (20%)



2. A beam of T cross section is formed by nailing two boards having the dimensions shown in the figure. If the total shear force, V, acting on the cross section is 872 N and each nail can carry 400 N in shear, what is the maximum allowable nail spacing? (20%)



3. As shown in the figure, a non-uniform beam is subject to a couple moment (M_0) and a concentrated loading (P) at point B. Please determine (a) the reaction force at point C, and (b) the deflection at point B. The width of the bean is b and the Young's modulus is E. (30%)



(背面仍有題目,請繼續作答)

4. (a). Explain what is Castigliano's theorem ? (10%)

(b). As shown in the figure, a simple beam supports a uniform loading q on the left-hand half of the span. Based on Castigliano's theorem, please determine the angle of rotation θ_B at support B. (20%)