

※考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. A cantilever beam is loaded as shown in Fig. 1. Determine (a) the deflection equation in terms of w_0 , L , x , E (Young's modulus), and I (moment of inertia) (10%), (b) the deflection at the right end of the beam (5%), (c) the support reactions V_A and M_A at the left end of the beam (5%).

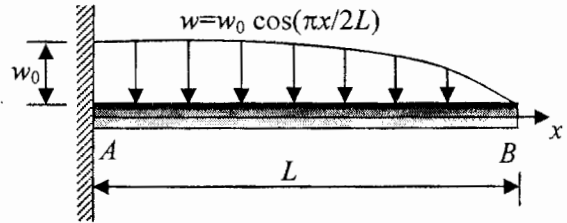


Fig. 1

2. A strain rosette (Fig.2), composed of three resistance gages making angles of 0° , 60° , and 120° with the x -axis, was used to measure the strains on the free surface of a steel component (Young's modulus = 3×10^7 psi and Poisson's ratio = 0.3). The measured strains were $\epsilon_0 = \epsilon_x = +10^{-3}$, $\epsilon_{60} = -0.65 \times 10^{-3}$, $\epsilon_{120} = +0.75 \times 10^{-3}$. (a) Determine the principal strains and the maximum shearing strain at the point (10%); (b) show the directions of the in-plane principal strains on a sketch (5%); (c) determine the principal stresses and the maximum shearing stress at the point (10%); (d) show the principal stresses and the maximum shearing stress on a sketch (5%).

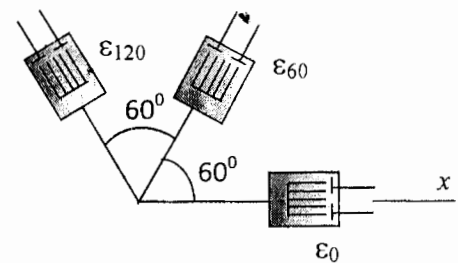


Fig. 2

3. A cylindrical pressure vessel with flat ends is subjected to a torque T , a bending moment M (as shown in Fig. 3), and an internal pressure p . The outer radius is r_0 and the wall thickness is t . Determine the maximum tensile stress, maximum compressive stress, and maximum shear stress in the wall of the cylinder (25%).

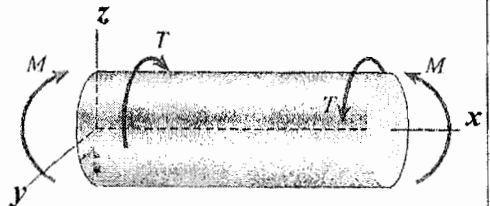


Fig. 3

4. For the ideal column shown in Fig. 4, by solving the differential equation of the deflection curve, determine (a) the critical load P_{cr} , (b) the equation of the buckled shape. (Hint: assume that the deflection at the free end of the column is δ .)

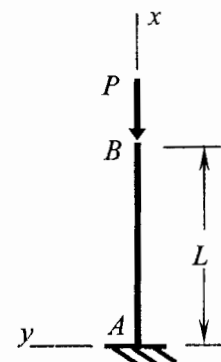


Fig. 4