

國立屏東科技大學九十七學年度碩士班暨碩士在職專班招生考試
材料力學

UNREGISTERED

1. A prismatic bar AB of solid circular cross section (diameter d and length L) is fixed at the left-hand end and free at the right-hand end (see Fig. 1). The bar is loaded by a distributed torque of constant intensity t per unit length. (a) What is the maximum shear stress in the bar? (b) What is the angle of twist at the end B? (25%) (G is the shear modulus of elasticity)
2. An element in plane stress at the surface of a large machine is subjected to stresses $\sigma_x = 100 \text{ MPa}$, $\sigma_y = 34 \text{ MPa}$, and $\tau_{xy} = 28 \text{ MPa}$, as shown in Fig. 2. Determine the following quantities: (a) the stresses acting on an element inclined at an angle $\theta = 40^\circ$, (b) the principle stresses, and (c) the maximum shear stresses. (Show all the results on sketches of properly oriented elements.) (25%)
3. A sign of dimensions $2.0 \text{ m} \times 1.2 \text{ m}$ is supported by a solid circular pole having diameter 220 mm , as shown in Fig. 3. The sign is offset 0.5 m from the centerline of the pole and its lower edge is 6 m above the ground. Determine the principal stresses at the point B at the base of the pole due to a wind pressure of 2000 Pa against the sign. (25%)
4. A cantilever beam ACB with two different moments of inertia supports a concentrated load P at the free end A, as shown in Fig. 4. Determine the deflection δ_A at the free end. (25%)

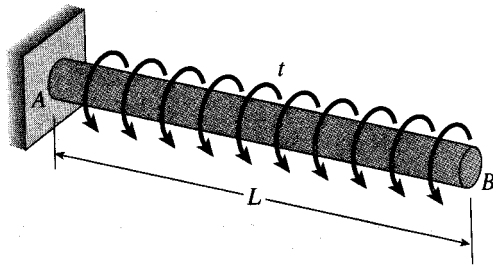


Fig. 1

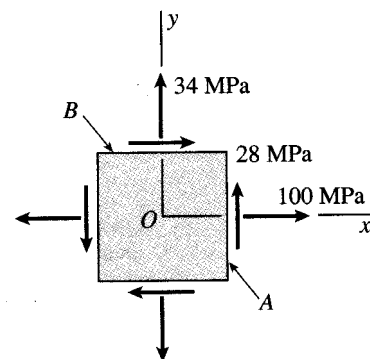


Fig. 2

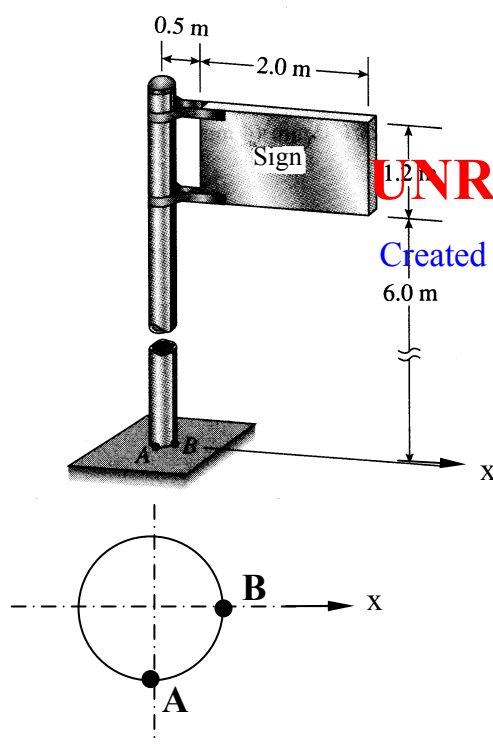


Fig. 3

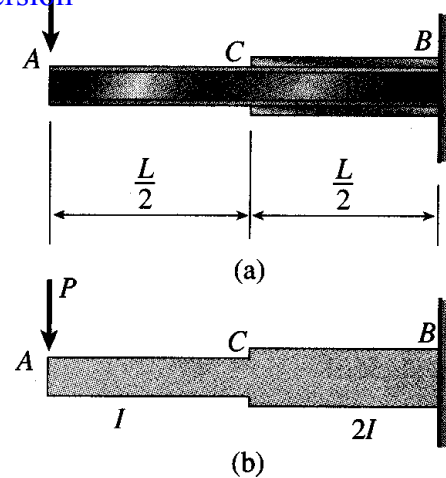


Fig. 4