

※ 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. The hydraulic cylinder shown in Fig. 1 exerts a force of 2 kN directed to the right on point B and to the left on point E. Determine the magnitude of the couple M required to rotate the drum clockwise at a constant speed. (25%)
2. The motor shown in Fig. 2 rotates at a frequency of 22.5 Hz and runs a machine attached to the shaft at B. Knowing that the motor develops 2.5 kW, determine the magnitude of the couple exerted (a) by the motor on pulley A, (b) by the shaft on pulley B. (25%)
3. A sign of dimensions 2.0 m \times 1.2 m is supported by a hollow circular pole having outer diameter 220 mm and inner diameter 180 mm (Fig. 3). The sign is offset 0.5 m from the centerline of the pole and its lower edge is 6.0 m above the ground. Determine the principal stresses and maximum shear stresses at points A and B at the base of the pole due to a wind pressure of 2.0 kPa against the sign. (25%)
4. A tapered bar AB of solid circular cross section is supported at one end and loaded by a torque T at the other end (Fig. 4). The diameter of the bar varies linearly from d_A at the left-hand end to d_B at the right-hand end. Determine the angle of rotation ϕ_A at end A of the bar by equating the strain energy to the work done by the load. (25%)

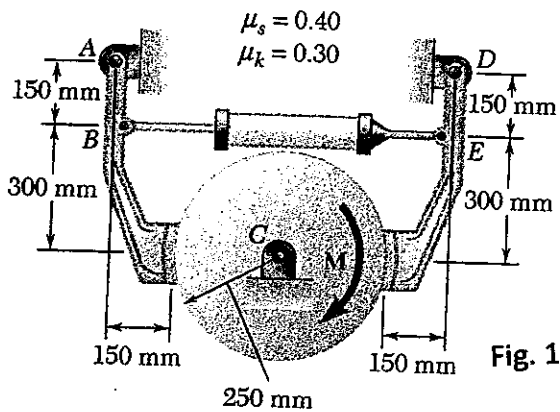


Fig. 1

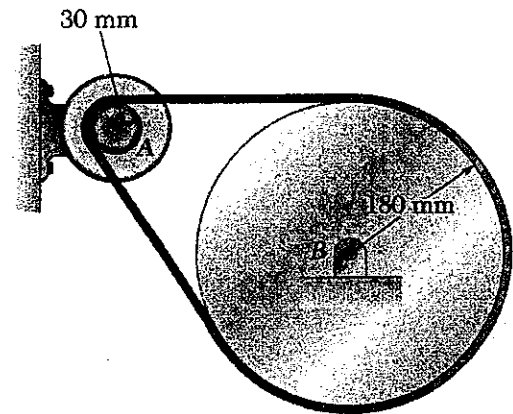


Fig. 2

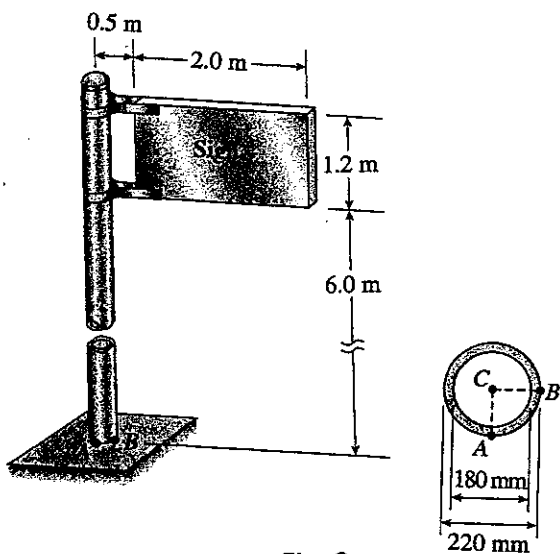


Fig. 3

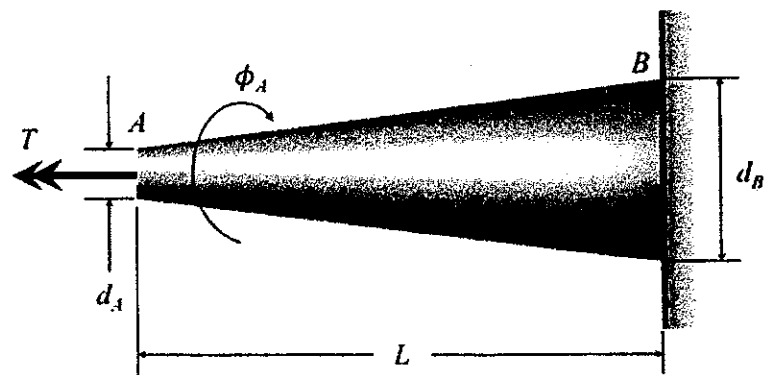


Fig. 4