

1. A uniform pipe cover of radius $r = 240$ mm and mass 30 kg is held in a horizontal position by the cable CD (Fig. 1). Assuming that the bearing at B does not exert any axial thrust, determine the tension in the cable and the reactions at A and B. (20 %)
2. Determine the moment of inertia of the shaded area in Fig. 2 with respect to the x-axis. (20 %)
3. When the forward speed of the truck shown in Fig. 3 was 30 ft/sec, the brakes were suddenly applied, causing all four wheels to stop rotating. It was observed that the truck skidded to rest in 20 feet. Determine the magnitude of the normal reaction and of the friction force at each wheel as the truck skidded to rest. (20 %)
4. A solid circular steel cylinder S is enhanced in a hollow circular copper tube C (Fig. 4a and b). The cylinder and tube are compressed between the rigid plates of a testing machine by compressive forces P. The steel cylinder has cross-sectional area A_s and modulus of elasticity E_s , the copper tube has area A_c and modulus E_c , and both parts have length L. Determine the following quantities: (a) the compressive forces P_s in the steel cylinder and P_c in the copper tube; (b) the corresponding compressive stresses σ_s and σ_c ; and (c) the shortening δ of the assembly. (20 %)
5. A 45° strain rosette consists of three electrical resistance strain gages arranged to measure strains in two perpendicular directions and also at a 45° angle between them, as shown in Fig. 5a. The rosette is bonded to the surface of the structure before it is loaded. Gages A, B, and C measure the normal strains ϵ_a , ϵ_b , and ϵ_c in the directions of lines Oa, Ob, and Oc, respectively. Explain how to obtain the strains ϵ_{x1} , ϵ_{y1} , and γ_{x1y1} associated with an element oriented at an angle θ to the xy axes (Fig. 5b). (20 %)

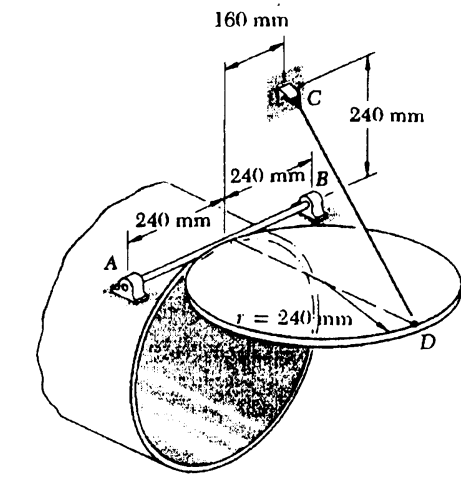


Fig. 1

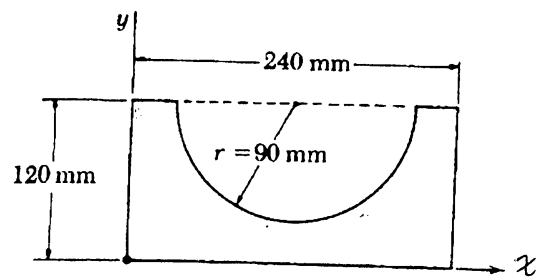


Fig. 2

(背面仍有題目,請繼續作答)

本試題是否可以使用計算機： 可使用， 不可使用（請命題老師勾選）

考試日期：0301，節次：1

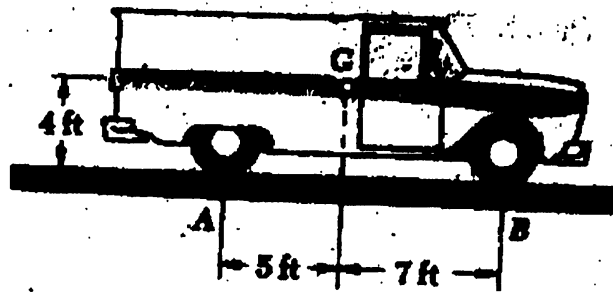


Fig. 3

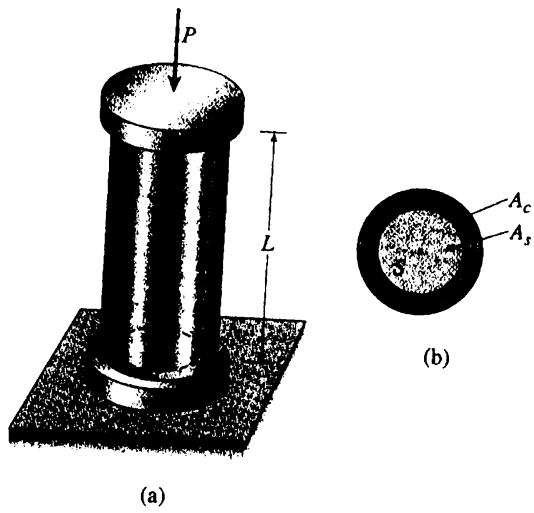


Fig. 4

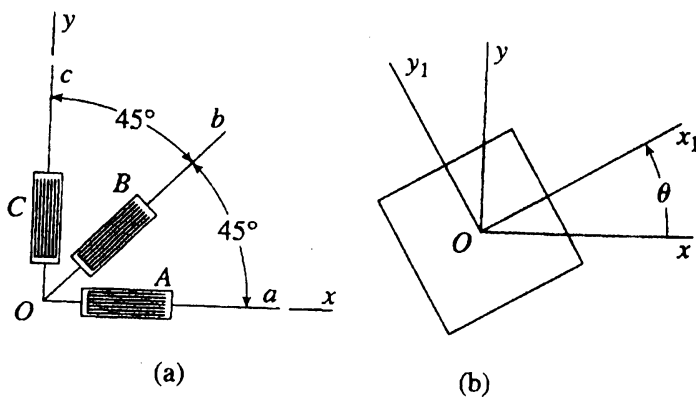


Fig. 5