

工程力學

Exam. # 4 (01/11/2019)

1. (20pts) A 15° wedge is forced under a 50-kg pipe as shown in Fig. 1. Knowing that the coefficient of static friction at both surfaces of the wedge is 0.20, determine the largest coefficient of static friction between the pipe and the vertical wall for which slipping will occur at A .

2. (20pts) Prove the following relation of the V-belt (Fig. 2):

$$\frac{T_2}{T_1} = e^{\mu_s \beta / \sin(\alpha/2)}$$

where T_1 and T_2 are the tensions, μ_s is the coefficient of static friction, β is the angle of belt contact, and α is angle of the V-shape.

3. (20pts) The position of the automobile jack shown is controlled by a screw ABC that is single-threaded at each end (right-handed thread at A , left-handed thread at C) as shown in Fig. 3. Each thread has a pitch of 2 mm and a mean diameter of 7.5 mm. If the coefficient of static friction is 0.15, determine the magnitude of the couple M that must be applied to raise the automobile.
4. (20pts) Determine the moment of inertia \bar{I}_x of the area shown in Fig. 4 with respect to the centroidal axis parallel to side AB .
5. (20pts) Determine by direct integration the mass moment of inertia with respect to the x axis of the pyramid shown in Fig. 5, assuming that it has a uniform density and a mass m .

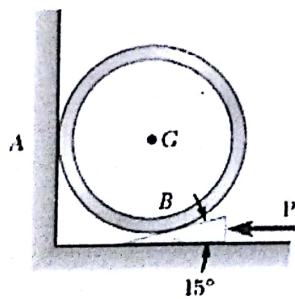


Fig 1

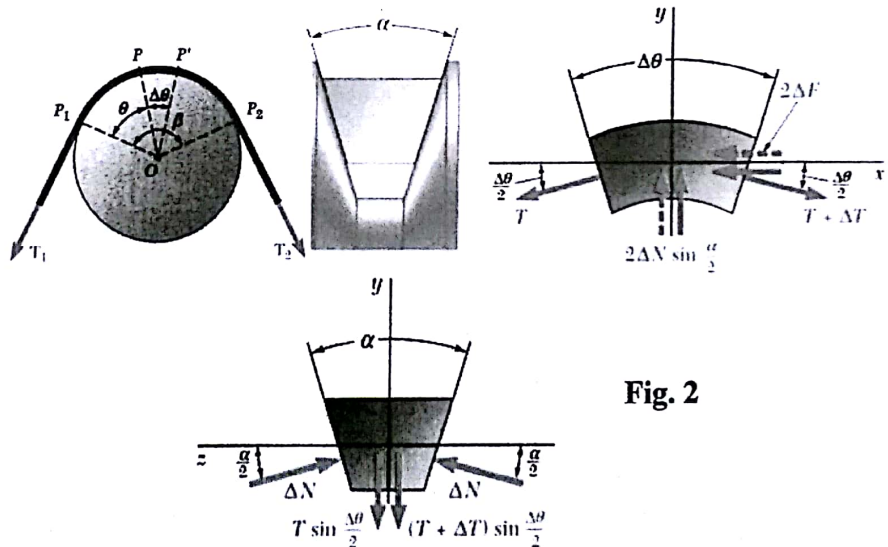


Fig. 2

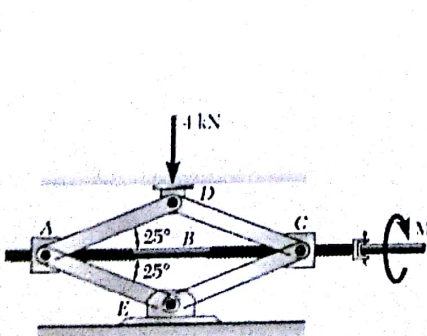


Fig. 3

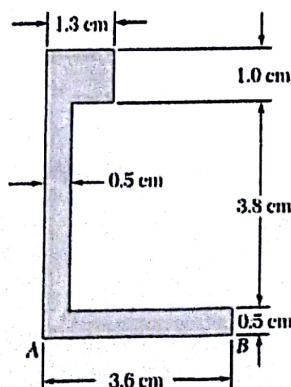


Fig. 4

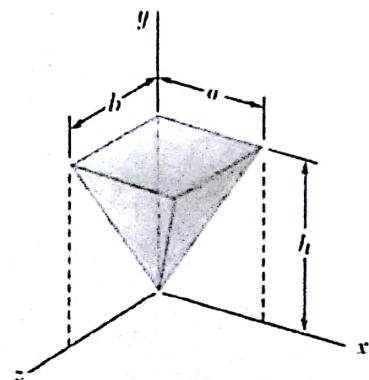


Fig. 5