

工程力学

Exam # 4 (01/15/2018)

1. (15pts) The 50-N plate $ABCD$ is attached at A and D to collars that can slide on the vertical rod. Knowing that the coefficient of static friction is 0.40 between both collars and the rod, determine whether the plate is in equilibrium in the position shown in Fig. 1 when the magnitude of the vertical force applied at E is (a) $P = 0$, (b) $P = 20$ N. yes not

2. (15pts) 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 in Fig. 3 is controlled by a screw ABC that is single-threaded at each end (right-handed thread at A , left-handed thread at C). 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. Lead = pitch
4. (15pts) Determine the polar moment of the area shown in Fig. 4 with respect to point O .
5. (15pts) Determine the moments of inertia I_x and I_y of the area shown in Fig. 5 with respect to centroidal axes respectively parallel and perpendicular to side AB .
6. (20pts) Determine by direct integration the mass moment of inertia with respect to the z axis of the right circular cylinder shown in Fig 6, assuming that it has a uniform density and a mass m .

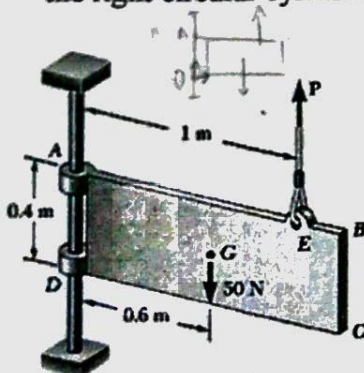


Fig 1

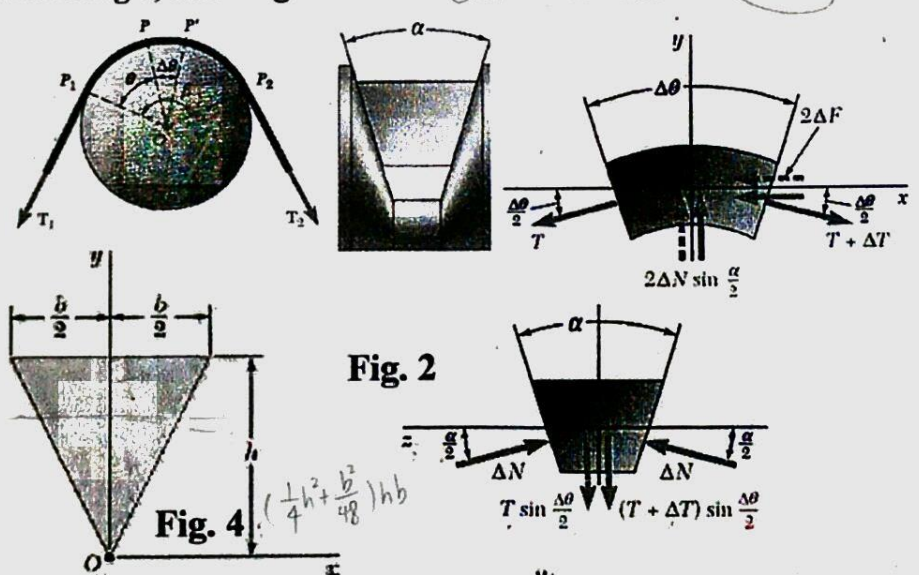


Fig. 2

Fig. 4

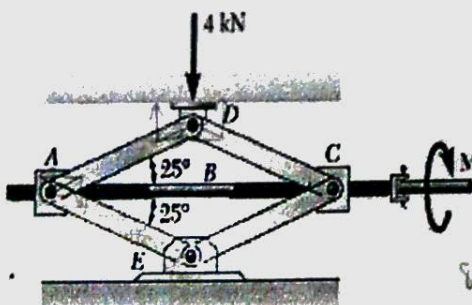


Fig. 3

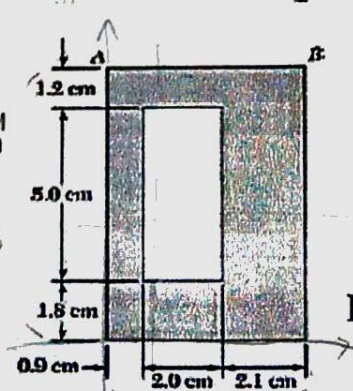


Fig. 5

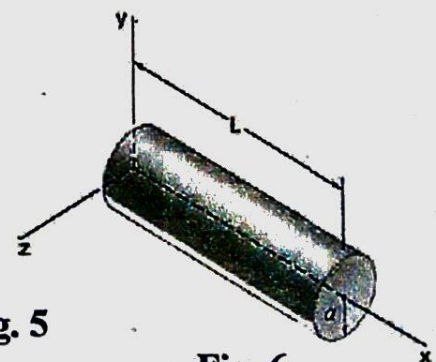


Fig. 6

$0.0138 \text{ kN} \cdot \text{m}$
 $1.84 \text{ kN} \cdot \text{m}$

$I_x = 1913 \text{ cm}^4$
 $I_y = 75.2 \text{ cm}^4$

$\frac{1}{12} m (3a^2 + 4L^2)$