Ans.

8–94.

A minimum force of P = 50 lb is required to hold the cylinder from slipping against the belt and the wall. Determine the weight of the cylinder if the coefficient of friction between the belt and cylinder is $\mu_s = 0.3$ and slipping does not occur at the wall.

SOLUTION

Equations of Equilibrium: Write the moment equation of equilibrium about point *A* by referring to the FBD of the cylinder shown in Fig. *a*,

$$\zeta + \Sigma M_A = 0; \quad 50(0.2) + W(0.1) - T_2 \cos 30^\circ (0.1 + 0.1 \cos 30^\circ) - T_2 \sin 30^\circ (0.1 \sin 30^\circ) = 0$$
(1)

Frictional Force on Flat Belt: Here, $T_1 = 50$ lb,

$$\beta = \left(\frac{30^{\circ}}{180^{\circ}}\right)\pi = \frac{\pi}{6} \text{ rad. Applying Eq. 8-6}$$
$$T_2 = T_1 e^{\mu\beta}$$
$$= 50 e^{0.3} \left(\frac{\pi}{6}\right) = 58.50 \text{ lb}$$

Substitute this result into Eq. (1),

W = 9.17 lb



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8–95.

The cylinder weighs 10 lb and is held in equilibrium by the belt and wall. If slipping does not occur at the wall, determine the minimum vertical force P which must be applied to the belt for equilibrium. The coefficient of static friction between the belt and the cylinder is $\mu_s = 0.25$.

SOLUTION

Equations of Equilibrium:

$$\zeta + \Sigma M_A = 0; \qquad P(0.2) + 10(0.1) - T_2 \cos 30^\circ (0.1 + 0.1 \cos 30^\circ) - T_2 \sin 30^\circ (0.1 \sin 30^\circ) = 0$$
(1)

Frictional Force on Flat Belt: Here, $\beta = 30^{\circ} = \frac{\pi}{6}$ rad and $T_1 = P$. Applying Eq. 8–6,

 $T_2 = T_1 e^{\mu\beta}$, we have

$$T_2 = P e^{0.25(\pi/6)} = 1.140P$$
⁽²⁾

Solving Eqs. (1) and (2) yields

$$P = 78.7 \, \text{lb}$$
 Ans.

$$T_2 = 89.76 \, \text{lb}$$

