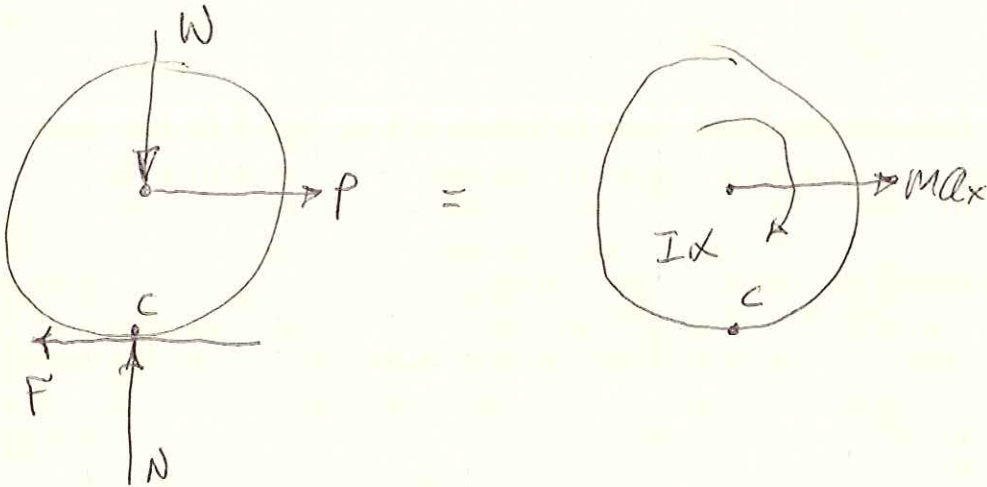


PROB. 16-98

$$r_1 = \frac{1}{3} \text{ ft}, \quad r_2 = \frac{2}{3} \text{ ft}, \quad W = 10 \text{ LB}, \quad k = \frac{1}{2} \text{ ft}, \quad P = 5 \text{ LB},$$
$$\mu_s = 0.25, \quad \mu_k = 0.2$$

DETERMINE IF DISK SLIDES, α , a_x



FOR NO SLIPPING,

$$\sum M_C = \sum (M_C)_{\text{EFF}} \uparrow \circlearrowleft : -r_2 P = -r_2 \alpha I - I \alpha$$

$$a_x = r_2 \alpha, \quad I = m k^2 = \left(\frac{W}{g}\right) k^2$$

$$r_2 P = r_2 \left(\frac{W}{g}\right) r_2 \alpha = \left(\frac{W}{g}\right) k^2 \alpha$$

$$\alpha = \frac{g r_2 P}{W(r_2^2 + k^2)} = \frac{(32.2 \frac{\text{ft}}{\text{s}^2}) \left(\frac{2}{3} \text{ ft}\right) (5 \text{ LB})}{(10 \text{ LB}) \left[\left(\frac{2}{3} \text{ ft}\right)^2 + \left(\frac{1}{2} \text{ ft}\right)^2 \right]} = 15.46 \frac{\text{RAD}}{\text{s}^2} \alpha$$

$$\sum F_x = m a_x : P - F = m a_x, \quad \text{plus}$$

$$F = P - \left(\frac{W}{g}\right) r_2 \alpha = (5 \text{ LB}) - \left(\frac{10 \text{ LB}}{32.2 \text{ ft/s}^2}\right) \left(\frac{2}{3} \text{ ft}\right) (15.46 \frac{\text{RAD}}{\text{s}^2})$$

$$F = 1.8 \text{ LB}$$

PROB. 16-98 CONT.

FOR NO SLIPPING, THE MAXIMUM FRICTION IS

$$F_{\max} = \mu_s N = \mu_s W = (0.25)(10^{\text{LB}}) = 2.5^{\text{LB}}$$

SINCE $F < F_{\max}$, DISK ROLLS WITHOUT SLIPPING

$$a_x = r_2 \alpha = \left(\frac{2}{3} \text{ft}\right) \left(15.46 \frac{\text{RAD}}{\text{s}^2}\right) = 10.31 \frac{\text{ft}}{\text{s}^2} \rightarrow$$