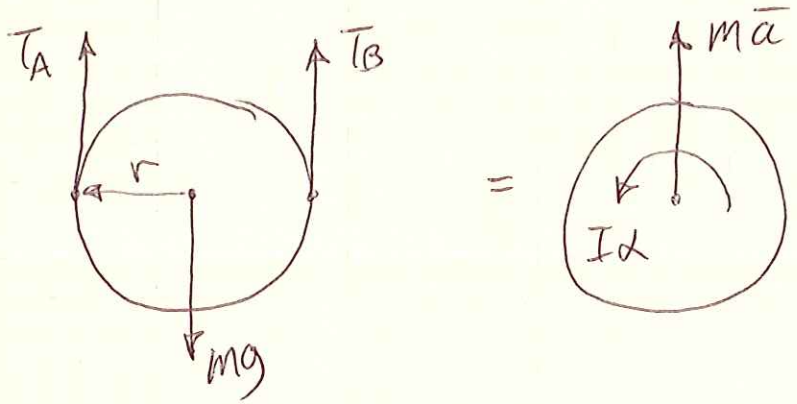
PROB. 16-55

$m = 3^{kg}$, $K = 0.07^{m}$, $T_A = 14^{N}$, $T_B = 18^{N}$, $r = 0.08^{m}$

FIND a_A, a_B.



$$\Sigma F_y = ma_y: \quad T_A + T_B - mg = m\bar{a}, \quad \bar{a} = \frac{1}{m}(T_A + T_B) - g$$

$$\Sigma \vec{M}_G = \Sigma (\vec{M}_G)_{EFF}: \quad -rT_A + rT_B = I\alpha$$

$$\alpha = \frac{r}{I}(T_B - T_A)$$

$$I = K^2 m$$

$$\alpha = \frac{r}{K^2 m}(T_B - T_A)$$

$$a_A = \bar{a} - r\alpha = \frac{1}{m}(T_A + T_B) - g - r\left[\frac{r}{K^2 m}(T_B - T_A)\right]$$

$$a_A = \frac{1}{m}(T_A + T_B) - g - \frac{r^2}{K^2 m}(T_B - T_A)$$

$$a_A = \frac{1}{(3^{kg})} \cdot (14 + 18^{N}) - \left(9.81 \frac{m}{s^2}\right) - \frac{(0.08^{m})^2}{(0.07^{m})^2 (3^{kg})} \cdot (18 - 14^{N})$$

$$\boxed{a_A = -0.8848 \frac{m}{s^2} \downarrow}$$

PROB. 16-55 CONT.

$$a_B = \bar{a} + r\alpha = \frac{1}{m}(T_A + T_B) - g + \frac{r^2}{k^2 m}(T_B - T_A)$$

$$a_B = \frac{1}{(3\,kg)} \cdot (14 + 18\,N) - \left(9.81\,\frac{m}{s^2}\right) + \frac{(0.08\,m)^2}{(0.07\,m)^2(3\,kg)} \cdot (18 - 14\,N)$$

$$a_B = 2.598\,\frac{m}{s^2}\uparrow$$