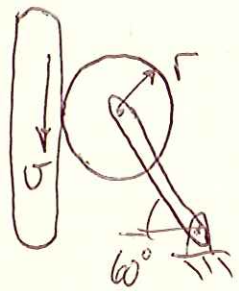
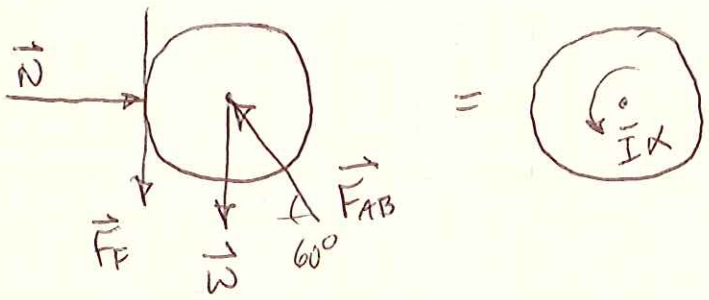
PROB. 16-28

$r = 0.18^m$, $\mu_K = 0.4$, FIND α



FBD OF WHEEL



$$\vec{F}_{AB} = F_{AB}\left[(-\cos 60^\circ)\hat{i} + (\sin 60^\circ)\hat{j}\right] = (-0.5F_{AB})\hat{i} + (0.866F_{AB})\hat{j}\ N$$

$$\Sigma F_x = m\bar{a}_x: \quad N - 0.5F_{AB} = 0 \Rightarrow N = 0.5F_{AB}$$

$$\Sigma F_y = m\bar{a}_y: \quad -F_F - mg + 0.866F_{AB} = 0$$

$$-\mu(0.5F_{AB}) - mg + 0.866F_{AB} = 0$$

$$F_{AB} = \frac{mg}{(0.866 - 0.5\mu)} = \frac{\left(9.81\frac{m}{s^2}\right)}{(0.866) - 0.5(0.4)} \cdot m = 14.73 \cdot m$$

$$N = 0.5(14.73 \cdot m) = 7.365 \cdot m, \quad F_F = (0.4)(7.365 \cdot m) = 2.946 \cdot m$$

$$\Sigma \vec{M}_G = \Sigma(\vec{M}_G)_{EFF}: \ +\circlearrowleft \quad rF_F = \bar{I}\alpha$$

$$\alpha = \frac{rF_F}{\bar{I}} = \frac{r(2.946 \cdot m)}{\frac{1}{2}mr^2} = \frac{2(2.946)}{(0.18^m)} = 32.73\ \frac{RAD}{s^2}\ \circlearrowleft$$