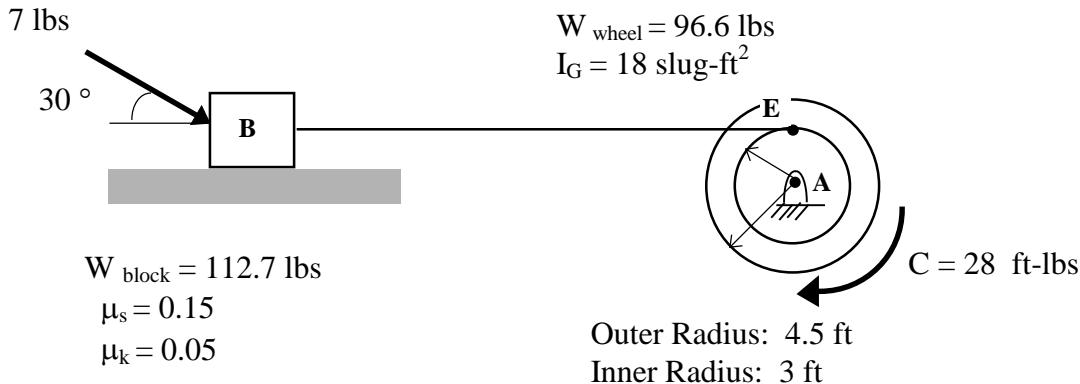


# EGM 3420C - Engineering Mechanics

## Dynamics Review Problems

**Problem 10.** The system shown below is initially at rest. The system is acted upon by an applied couple and an applied force. Assuming the rope connecting block B to wheel A remains taut, what is the velocity of Block B after 2 seconds?



USE IMPULSE-MOMENTUM TECHNIQUE

$$\begin{aligned} & \text{Block Translation: } \int_0^2 (T + 7 \sin(30^\circ)) dt = m_B V_{B2} \\ & f \int_0^2 (N - W_B - 7 \sin(30^\circ)) dt = 0 \\ & N = 112.7 + 3.5 = 116.2 \\ & \rightarrow \int_0^2 (T + 7 \cos(30^\circ) - 0.05(116.2)) dt = 3.5 V_{B2} \end{aligned}$$

$$\begin{aligned} & \text{Wheel RAFA: } \int_0^2 (T - 2I_G \alpha) dt = I_G (\omega_{A2}) \\ & \int_0^2 (-3T + 28) dt = 18 (\omega_{A2}) \\ & -6T + 56 = 18 \omega_{A2} \\ & V_{B2} = 3(\omega_{A2}) \end{aligned}$$

$$2T + 0.5 = 3.5(3\omega_{A2})$$

$$6T + 18\omega_{A2} = 56 \quad (2)$$

$$2T - 10.5\omega_{A2} = -0.5 \quad (1)$$

SOLVING (1)+(2)

$$\begin{bmatrix} 2 & -10.5 \\ 6 & 18 \end{bmatrix} \begin{Bmatrix} T \\ \omega_{A2} \end{Bmatrix} = \begin{Bmatrix} -0.5 \\ 56 \end{Bmatrix} \quad \begin{aligned} \omega_{A2} &= 1.16 \\ T &= 5.05 \end{aligned}$$

$$V_{B2} = 3\omega_{A2} = 3(1.16) = 3.48$$

Answer:  $V_B = 3.48 \text{ ft/s} \rightarrow$