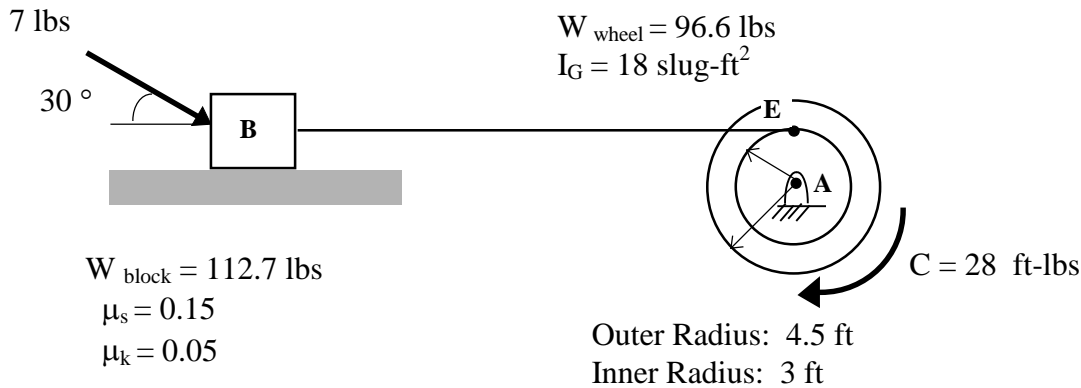


EGM 3420C - Engineering Mechanics Dynamics Review Problems

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

Block Translation

Mom 1 + Imp = Mom 2

$\int_0^2 (N - W_B - 7 \sin(30^\circ)) dt = 0$

$N = 112.7 + 3.5 = 116.2$

$\rightarrow \int_0^2 (T + 7 \cos(30^\circ) - 0.05(116.2)) dt = 3.5 V_{B2}$

Wheel RAFA

Mom 1 + Imp = Mom 2

$\int_0^2 (-3T + 28) dt = 18 \omega_{A2}$

$-6T + 56 = 18 \omega_{A2}$

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

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

$2T - 10.5\omega_{A2} = -0.5$ ①

SOLVING ① + ②

$6T + 18\omega_{A2} = 56$ ②

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

$\omega_{A2} = 1.16$
 $T = 5.05$

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

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