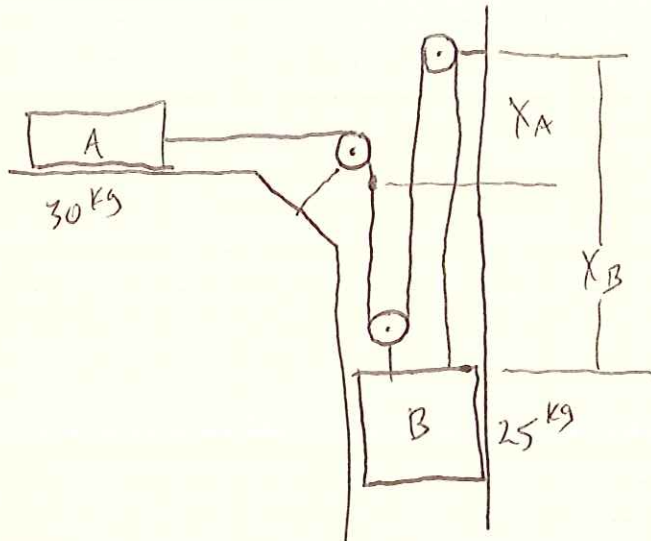


PROB. 12-12



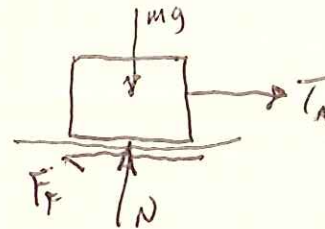
$$v_{0,A} = v_{0,B} = 0$$

$$\mu_s = 0.25, \mu_k = 0.20$$

FIND a_A, a_B, T

1. PENDING MOTION:

BLOCK A:



$$\sum F_x = 0: T_A = \mu_s N$$

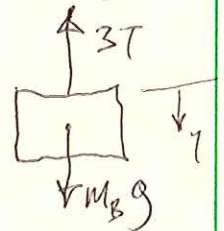
$$\sum F_y = 0: N = M_A g$$

$$T_A = \mu_s M_A g = (0.25)(30 \text{ kg})(9.81 \frac{\text{m}}{\text{s}^2}) = 73.57 \text{ N}$$

BLOCK B: $\sum F_y = 0: 3T_B = M_B g, T_B = \frac{1}{3} M_B g$

$$T_B = \frac{1}{3}(25 \text{ kg})(9.81 \frac{\text{m}}{\text{s}^2}) = 81.75 \text{ N}$$

SINCE $T_B > T_A$, THE BLOCKS WILL MOVE



$$2X_B + (X_B - X_A) = \text{CONSTANT}, \quad 3v_B - v_A = 0, \quad 3a_B - a_A = 0$$

$$a_A = 3a_B$$

BLOCK A: $\sum F_y = M a_y: N = M_A g$

$$\sum F_x = M a_x: T - \mu_k N = M_A a_A$$

$$T - \mu_k M_A g = M_A a_A \Rightarrow T = M_A (a_A + \mu_k g)$$

PROB. 12-12 CONT.

$$\text{BLOCK B: } \Sigma F_y = m_B a_B : m_B g - 3T = m_B a_B$$

$$m_B g - 3m_A (a_A + \mu_k g) = m_B a_B$$

$$m_B g - 3m_A (3a_B + \mu_k g) = m_B a_B$$

$$m_B a_B + 9m_A a_B = m_B g - 3\mu_k m_A g$$

$$a_B (m_B + 9m_A) = m_B g - 3\mu_k m_A g$$

$$a_B = \frac{(m_B - 3\mu_k m_A) g}{(m_B + 9m_A)} = \frac{[(25 \text{ kg}) - 3(0.2)(30 \text{ kg})](9.81 \frac{\text{m}}{\text{s}^2})}{[(25 \text{ kg}) + 9(30 \text{ kg})]}$$

$$a_B = 0.2327 \frac{\text{m}}{\text{s}^2} \downarrow$$

$$a_A = 3a_B = 0.6983 \frac{\text{m}}{\text{s}^2} \rightarrow$$

$$T = m_A (a_A + \mu_k g) = (30 \text{ kg}) \left[(0.6983 \frac{\text{m}}{\text{s}^2}) + (0.2)(9.81 \frac{\text{m}}{\text{s}^2}) \right]$$

$$T = 79.81 \text{ N}$$