

PROB. 14-34

FIND ENERGY LOST AS BULLET (a) PASSES THROUGH BLOCK A, (b) EMBEDS IN BLOCK B.

$$W_1 = 0.05 \text{ lb}, \quad v_1 = 1500 \frac{\text{ft}}{\text{s}}, \quad v_{1'} = 900 \frac{\text{ft}}{\text{s}}$$

$$W_A = 6 \text{ lb}, \quad W_B = 4.95 \text{ lb}, \quad v_{A,2} = 5 \frac{\text{ft}}{\text{s}}, \quad v_{B,2} = 9 \frac{\text{ft}}{\text{s}}$$

$$T_1 + U_{1-2} = T_2 \Rightarrow U_{1-2} = T_2 - T_1$$

$$T_1 = \frac{1}{2} m_1 v_1^2 = \frac{1}{2} \left(\frac{0.05}{32.2} \right) (1500)^2 = 1747 \text{ ft-lb}$$

$$T_2 = \frac{1}{2} m_1 v_{1'}^2 + \frac{1}{2} m_A v_A^2$$

$$T_2 = \frac{1}{2} \left(\frac{0.05}{32.2} \right) (900)^2 + \frac{1}{2} \left(\frac{6}{32.2} \right) (5)^2 = 631.2 \text{ ft-lb}$$

$$U_{1-2} = 631.2 - 1747 = \boxed{-1116 \text{ ft-lb}}$$

BULLET HITS BLOCK B:

$$U_{1-2} = T_2 - T_1$$

$$T_1 = \frac{1}{2} m_1 v_{1'}^2 = \frac{1}{2} \left(\frac{0.05}{32.2} \right) (900)^2 = 628.9 \text{ ft-lb}$$

$$T_2 = \frac{1}{2} (m_1 + m_B) v_B^2 = \frac{1}{2} \left(\frac{0.05 + 4.95}{32.2} \right) (9)^2 = 6.29 \text{ ft-lb}$$

$$U_{1-2} = 6.29 - 628.9 = \boxed{622.6 \text{ ft-lb}}$$