PROB. 11-57

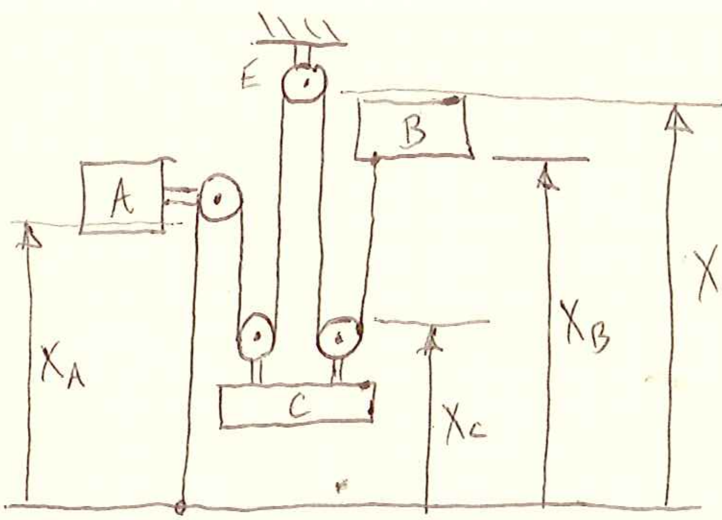
$(v_A)_0 = 0,\ a_A = -7 \frac{in}{s^2} \downarrow,\ (v_B)_0 = 8 \frac{in}{s} \uparrow$

$@\ t = 2^s,\ x_B - (x_B)_0 = 20^{in}$

FIND a_B, a_C

FIND t WHEN $v_C = 0$

FIND $x_C - (x_C)_0$ WHEN $v_C = 0$



BLOCK B:

$$x_B - (x_B)_0 = (v_B)_0 \cdot t + \frac{1}{2} a_B \cdot t^2$$

$$a_B = \frac{2}{t^2} \left\{ \left[x_B - (x_B)_0 \right] - (v_B)_0 \cdot t \right\}$$

$$a_B = \frac{2}{(2^s)^2} \cdot \left\{ (20^{in}) - \left(8 \tfrac{in}{s}\right)(2^s) \right\} \boxed{= 2 \tfrac{in}{s^2} \uparrow}$$

LENGTH OF ROPE IS CONSTANT:

$$x_A + (x_A - x_C) + 2(x_E - x_C) + (x_B - x_C) = \text{CONSTANT}$$

$$2x_A - 4x_C + 2x_E + x_B = \text{CONSTANT}$$

PROB. 11-57

$$2v_A - 4v_C + 2v_E + v_B = 0 \qquad v_E = 0$$

$$2v_A - 4v_C + v_B = 0$$

$$2a_A - 4a_C + a_B = 0$$

$$a_C = \frac{1}{4}(2a_A + a_B) = \frac{1}{4}\left[2\left(-7\,\tfrac{\text{in}}{\text{s}^2}\right) + \left(2\,\tfrac{\text{in}}{\text{s}^2}\right)\right] \boxed{= -3\,\tfrac{\text{in}}{\text{s}^2}\downarrow}$$

FIND t WHEN $v_C = 0$:

$$v_C = (v_C)_0 + a_C \cdot t$$

$$t = \frac{v_C - (v_C)_0}{a_C} \qquad \text{NEED } (v_C)_0$$

$$2(v_A)_0 - 4(v_C)_0 + (v_B)_0 = 0$$

$$(v_C)_0 = \frac{1}{4}\left[2(v_A)_0 + (v_B)_0\right] = \frac{1}{4}\left[2(0) + \left(8\,\tfrac{\text{in}}{\text{s}}\right)\right] = 2\,\tfrac{\text{in}}{\text{s}}$$

$$t = \frac{(0) - \left(2\,\tfrac{\text{in}}{\text{s}}\right)}{\left(-3\,\tfrac{\text{in}}{\text{s}^2}\right)} \boxed{= 0.667^{\text{s}}}$$

FIND $X_C - (X_C)_0$ WHEN $v_C = 0$

$$X_C - (X_C)_0 = (v_C)_0 \cdot t + \frac{1}{2} a_C \cdot t^2$$

$$X_C - (X_C)_0 = \left(2\,\tfrac{\text{in}}{\text{s}}\right)\left(0.667^{\text{s}}\right) + \frac{1}{2}\left(-3\,\tfrac{\text{in}}{\text{s}^2}\right)\left(0.667^{\text{s}}\right)^2$$

$$\boxed{X_C - (X_C)_0 = 0.667^{\text{in}}}$$