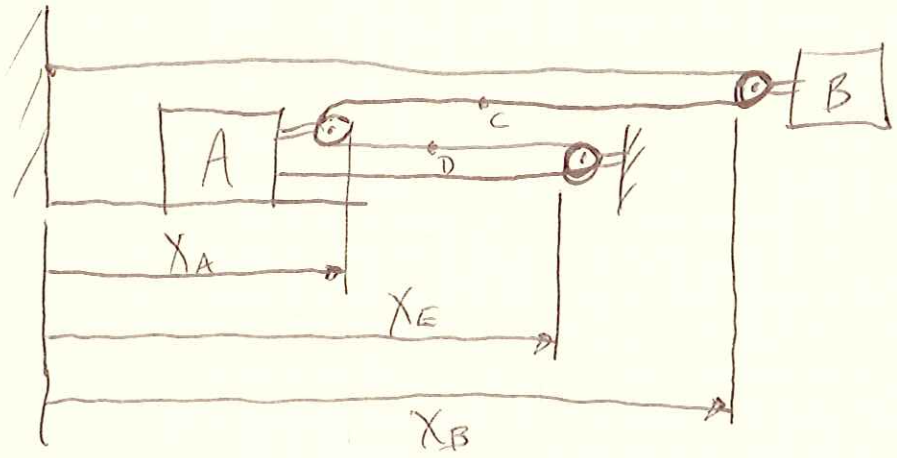
PROB. 11-54

$(v_B)_0 = 150 \frac{mm}{s} \rightarrow$, $v_A = 60 \frac{mm}{s}$ WHEN $x_A - (x_A)_0 = 240\ mm$

FIND a_A, a_B, a_D. FIND v_B AND $x_B - (x_B)_0$ AFTER $t = 4\ s$

$$v_A^2 = (v_A)_0^2 + 2a_A[x_A - (x_A)_0]$$

$$a_A = \frac{v_A^2 - (v_A)_0^2}{2[x_A - (x_A)_0]} \qquad \text{NEED } (v_A)_0$$



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

$$2x_B - 3x_A + 2x_E = \text{CONSTANT}$$

$$2v_B - 3v_A + 2v_E = 0 \qquad v_E = 0$$

$$2v_B - 3v_A = 0$$

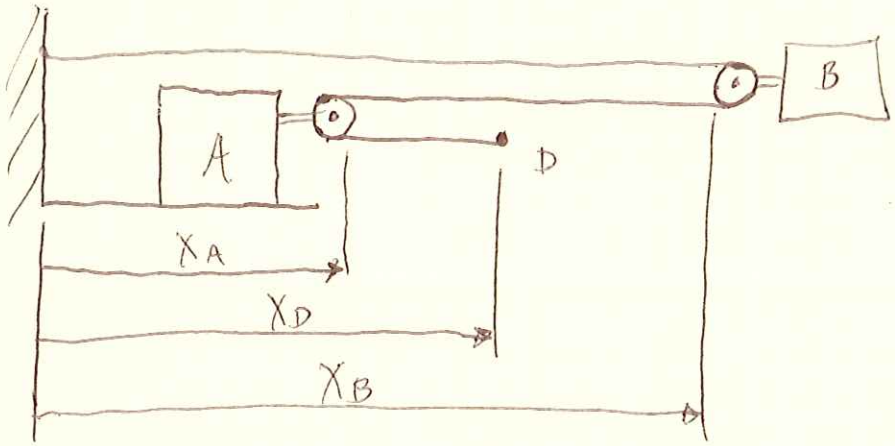
$$(v_A)_0 = \frac{2}{3}(v_B)_0 = \frac{2}{3}\left(150 \frac{mm}{s}\right) = 100 \frac{mm}{s}$$

$$a_A = \frac{\left(60 \frac{mm}{s}\right)^2 - \left(100 \frac{mm}{s}\right)^2}{2(240\ mm)} = -13.3 \frac{mm}{s^2} \leftarrow$$

$$2a_B - 3a_A = 0$$

PROB. 11-54 CONT.

$$a_B = \frac{3}{2} a_A = \frac{3}{2}\left(-13.3 \frac{mm}{s^2}\right) = -20 \frac{mm}{s^2} \leftarrow$$



$$x_B + (x_B - x_A) + (x_D - x_A) = \text{CONSTANT}$$

$$2x_B - 2x_A + x_D = \text{CONSTANT}$$

$$2v_B - 2v_A + v_D = 0$$

$$2a_B - 2a_A + a_D = 0$$

$$a_D = 2(a_A - a_B) = 2\left[(-13.3) - (-20) \frac{mm}{s^2}\right] = 13.3 \frac{mm}{s^2} \rightarrow$$

AFTER $t = 4^s$,

$$v_B = (v_B)_0 + a_B \cdot t = \left(150 \frac{mm}{s}\right) + \left(-20 \frac{mm}{s^2}\right)(4^s)$$

$$v_B = 70 \frac{mm}{s} \rightarrow$$

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

$$= \left(150 \frac{mm}{s}\right)(4^s) + \frac{1}{2}\left(-20 \frac{mm}{s^2}\right)(4^s)^2$$

$$x_B - (x_B)_0 = 440 \text{ mm} \rightarrow$$