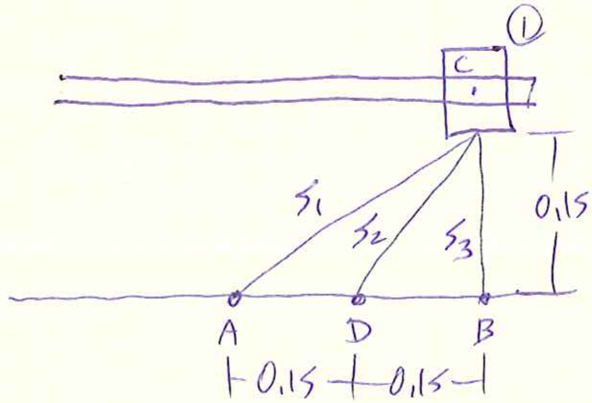
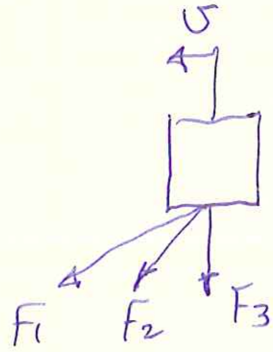
PROB. 13-57

$m = 1.2\ kg,\quad K = 400\ \frac{N}{m},\quad x_0 = 150^{mm} = 0.15^{m},\quad$ FIND v_{max}

v_{max} OCCURS AT POINT OF EQUILIBRIUM



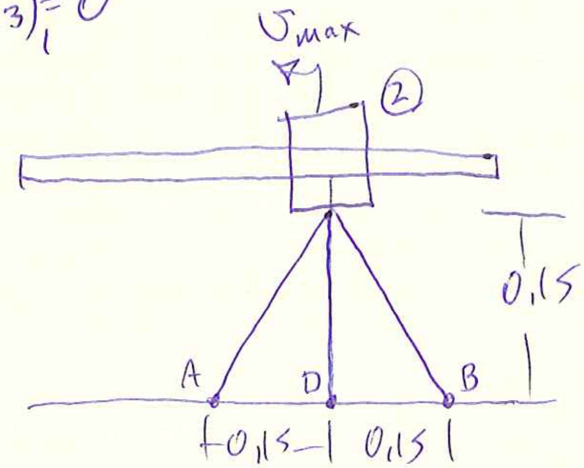


AT POINT 1, $l_1 = \sqrt{0.15^2 + 0.3^2} = 0.3354^m,\quad (\Delta l_1)_1 = 0.3354 - 0.15$

$(\Delta l_1)_1 = 0.1854^m$

$l_2 = \sqrt{0.15^2 + 0.15^2} = 0.2121^m,\quad (\Delta l_2)_1 = 0.2121 - 0.15 = 0.06213^m$

$(\Delta l_3)_1 = 0$



AT POINT 2, $l_1 = \sqrt{0.15^2 + 0.15^2},\quad (\Delta l_1)_2 = 0.06213^m$

$(\Delta l_2)_2 = 0$

$(\Delta l_3)_2 = (\Delta l_1)_2 = 0.06213^m$

PROB. 13-57 CONT.

$$T_1 + V_1 = T_2 + V_2$$

AT POINT 1, $v_1 = 0 \therefore T_1 = \frac{1}{2} m v_1^2 = 0$

$$V_1 = \frac{1}{2} k_1 (\Delta l_1)_1^2 + \frac{1}{2} k_2 (\Delta l_2)_1^2 = \frac{k}{2}\left[(\Delta l_1)_1^2 + (\Delta l_2)_1^2\right]$$

AT POINT 2: $T_2 = \frac{1}{2} m v_2^2$

$$V_2 = \frac{1}{2} k_1 (\Delta l_1)_2^2 + \frac{1}{2} k_3 (\Delta l_3)_2^2 = \frac{k}{2}\left[(\Delta l_1)_2^2 + (\Delta l_3)_2^2\right]$$

$$\frac{k}{2}\left[(\Delta l_1)_1^2 + (\Delta l_2)_1^2\right] = \frac{1}{2} m v_2^2 + \frac{k}{2}\left[(\Delta l_1)_2^2 + (\Delta l_3)_2^2\right]$$

$$v_2 = \sqrt{\frac{k}{m}\left[(\Delta l_1)_1^2 + (\Delta l_2)_1^2 - (\Delta l_1)_2^2 - (\Delta l_3)_2^2\right]}$$

$$v_2 = \sqrt{\frac{(400 \frac{N}{m})}{(1.2 \text{ kg})} \cdot \left(\frac{\text{kg} \cdot \text{m}}{\text{N} \cdot \text{s}^2}\right) \cdot \left[(0.1854)^2 + (0.06213)^2 - (0.06213)^2 - (0.06213)^2\right]}$$

$$\boxed{v_2 = 3.189 \frac{m}{s}}$$