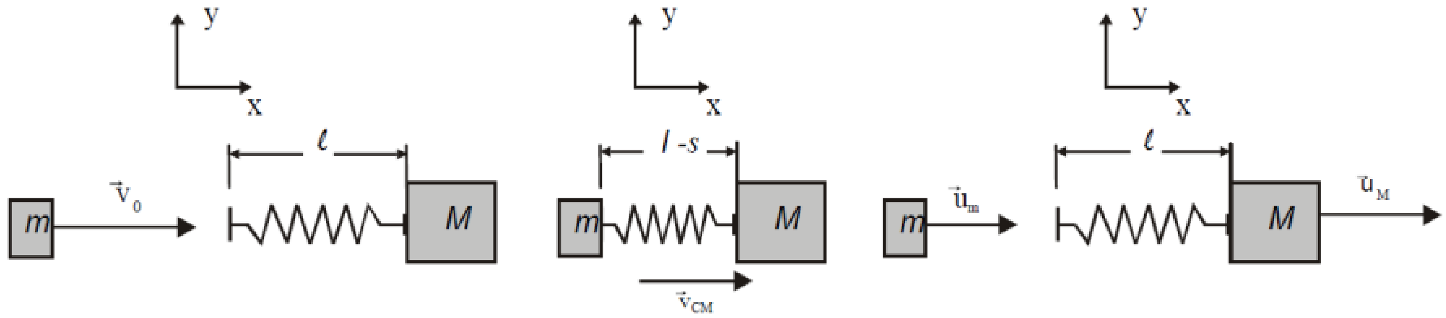
Ejercicio 11 (LB Cap. 10 Ej. 37) PP

Un bloque de masa *m* se mueve a una velocidad v_0 y choca con otro bloque de masa *M*, fijo a un resorte cuya constante es *k*. ¿Cuál es la compresión máxima ***s*** del resorte? Determine la velocidad de salida de cada bloque.



(a) (b) (c)

a)

$P_a = m . V_0$

$E_a = \frac{m V_0^2}{2}$

$P_a = P_b$

$E_a = E_b$

b)

$P_b = (M+m) . V_{CM}$

$E_b = \frac{(m+M) V_{CM}^2}{2} + \frac{K . s^2}{2}$

$m V_0 = (m+M) V_{CM} \longrightarrow V_{CM} = \frac{m V_0}{m+M}$

$$\frac{mV_0^2}{\cancel{2}} = \frac{(m+M)V_{cm}^2}{\cancel{2}} + \frac{Ks^2}{\cancel{2}}$$

$$mv_0^2 = \cancel{(m+M)}\frac{m^2V_0^2}{(m+M)^{\cancel{2}}} + Ks^2$$

$$mV_0^2 - \frac{m^2V_0^2}{m+M} = Ks^2$$

$$\frac{\cancel{m^2V_0^2} + mMv_0^2 - \cancel{m^2V_0^2}}{m+M} = Ks^2$$

$$S = \sqrt{\frac{mMv_0^2}{K(m+M)}} = \boxed{V_0\sqrt{\frac{mM}{K(m+M)}}}$$

$$P_a = P_c \rightarrow mV_0 = m\cdot U_m + M\cdot U_M \longrightarrow U_m = \frac{mV_0 - MU_M}{m}$$

$$E_a = E_c \rightarrow \frac{mV_0^2}{\cancel{2}} = \frac{mU_m^2}{\cancel{2}} + \frac{MU_M^2}{\cancel{2}}$$

$$mV_0^2 = m\left(\frac{mV_0 - MU_M}{m}\right)^2 + MU_M^2$$

$$mV_0^2 = \cancel{m}\left(\frac{m^2V_0^2 - 2\cdot mV_0\cdot M\cdot U_M + M^2U_M^2}{m^{\cancel{2}}}\right) + MU_M^2$$

$$\cancel{mV_0^2} = \cancel{mV_0^2} - 2V_0MU_M + \frac{M^2}{m}U_M^2 + MU_M^2$$

$$\underbrace{U_M}_{=0}\left(\underbrace{-2V_0\cancel{M} + \frac{M^{\cancel{2}}}{m}U_M + \cancel{M}U_M}_{=0}\right) = 0$$

$$U_M\left(\frac{M}{m}+1\right) = 2V_0$$

$$\boxed{U_M = \frac{2V_0}{1+\frac{M}{m}}}$$

$$U_m = \frac{mV_0 - MU_M}{m} \qquad U_m = \frac{mV_0 - \frac{2V_0 M}{1+\frac{M}{m}}}{m}$$

$$U_m = V_0 - \frac{2V_0\frac{M}{m}}{1+\frac{M}{m}} = \frac{V_0 + V_0\cdot\frac{M}{m} - 2V_0\frac{M}{m}}{1+\frac{M}{m}}$$

$$\boxed{U_m = \frac{V_0\left(1-\frac{M}{m}\right)}{1+\frac{M}{m}}}$$