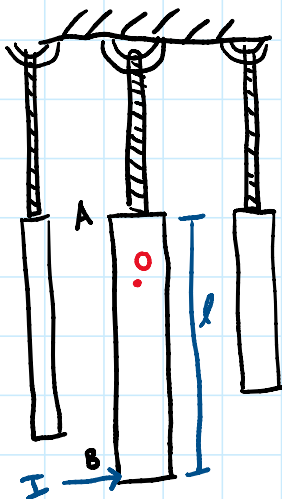
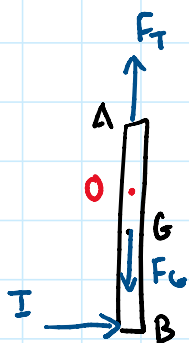


Intermediate Principle of Impulse and Momentum Video

Inspiration: 19-13 Hibbeler



A wind chime consists of several slender rods, each suspended on one end by a rope and each with mass m . The wind blows and one rod is subjected to an impulse I at its bottom. Determine the vertical location of point O in which the rod appears to rotate.



$$X: m v_{Gx_1} + \sum \int_{t_1}^{t_2} F_x dt = m v_{Gx_2}$$

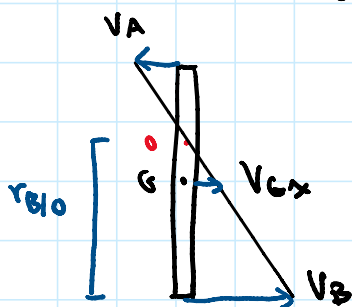
$$0 + I = m v_{Gx_2}$$

$$M: I_G \omega_1 + \sum \int_{t_1}^{t_2} M_G dt = I_G \omega_2$$

$$0 + I\left(\frac{l}{2}\right) = \frac{1}{12} m l^2 \omega_2 \quad I = \frac{1}{6} m l \omega_2$$

$$\frac{1}{6} m l \omega_2 = m v_{Gx_2} \quad v_{Gx_2} = \frac{1}{6} l \omega_2$$

Point O acts as the ICZV $\Rightarrow v_B = \omega r_{B/O}$



$$\frac{v_B}{r_{B/O}} = \frac{v_{Gx}}{r_{G/O} - \frac{l}{2}}$$

$$\frac{\omega r_{B/O}}{r_{B/O}} = \frac{\frac{1}{6} l \omega}{r_{B/O} - \frac{l}{2}}$$

$$\omega r_{B/O} - \omega \frac{l}{2} = \frac{1}{6} l \omega$$

$$r_{B/O} - \frac{l}{2} = \frac{1}{6} l$$

$$r_{B/O} = \frac{2}{3} l$$