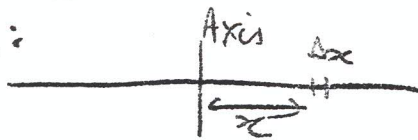


1988 RBM:



density:

$$\text{macro } \rho = \frac{m}{2l} \Rightarrow m = \rho \Delta x$$

$$\text{micro } \rho = \frac{\Delta m}{\Delta x} \Rightarrow \Delta m = \rho \Delta x$$

$$\Delta I = \Delta m x^2 = (\rho \Delta x) x^2$$

$$\Rightarrow I = \int_{-l}^l \rho x^2 dx$$

$$\Rightarrow I = \rho \left[ \frac{x^3}{3} \right]_{-l}^l$$

$$\Rightarrow I = \frac{\rho}{3} (l^3 - (-l)^3)$$

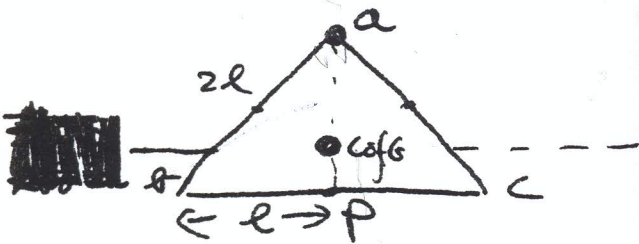
$$\Rightarrow I = \frac{2\rho l^3}{3}$$

$$\Rightarrow I = \frac{2l^2}{3} (\rho l)$$

$$\Rightarrow I = \frac{m l^2}{3}$$

(f)

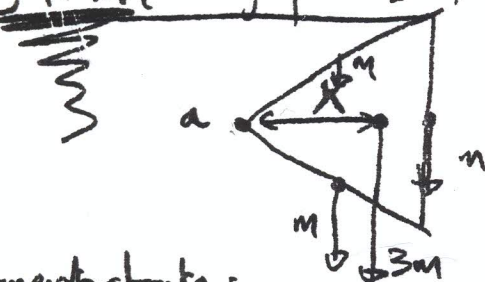
$$T = 2\pi \sqrt{\frac{I}{m_{\text{total}} g (\text{dist to CG})}}$$



$$|ap|^2 = (2l)^2 - l^2 = 3l^2$$

$$\Rightarrow |ap| = \sqrt{3}l$$

Find  $|a \text{ to CG}| = ?$



moments about a:

$$m \left( \frac{\sqrt{3}l}{2} \right) + m \frac{\sqrt{3}l}{2} + m \sqrt{3}l = 3m X$$

$$2\sqrt{3}l = 3X$$

$$X = \frac{2\sqrt{3}l}{3}$$

$$\text{MASS (Total)} = 3m$$

moments of Inertia

moI of system about a.

① moI of  $[ab] = \frac{4}{3} m l^2$

② moI of  $[ac] = \frac{4}{3} m l^2$

③ moI of  $[bc]$  about  $p = \frac{1}{3} m l^2$

$\Rightarrow$  moI of  $[bc]$  about a

$$= \frac{1}{3} m l^2 + m |ap|^2$$

$$= \frac{1}{3} m l^2 + m (\sqrt{3}l)^2$$

$$= \frac{1}{3} m l^2 + 3m l^2$$

$$= \frac{10}{3} m l^2$$

∴ Total moI of  $\Delta abc$  about a

$$= \left( \frac{4}{3} + \frac{4}{3} + \frac{10}{3} \right) m l^2$$

$$= 6m l^2$$

$$\therefore T = 2\pi \sqrt{\frac{6m l^2}{(3m) g \left( \frac{2\sqrt{3}l}{3} \right)}}$$

$$= 2\pi \sqrt{\frac{6m l^2}{2m g \sqrt{3}l}}$$

$$= 2\pi \sqrt{\frac{3l}{\sqrt{3}g}}$$

$$= 2\pi \sqrt{\frac{\sqrt{3}l}{g}}$$