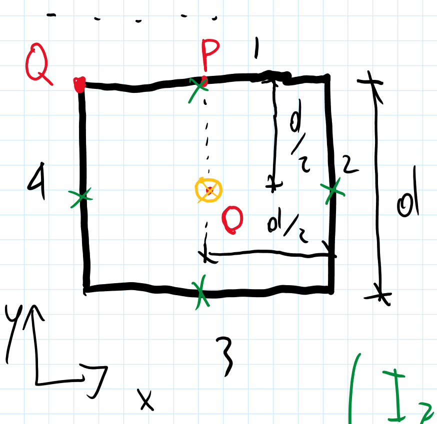
Tutorato 07

giovedì 20 aprile 2023 12:49

7.18



$m = 1{,}5\ kg$

$d = 0{,}8\ m$

I_z ?

$\left(I_z = \int_V \rho r^2 dr \right)$

PUNTO O

$\left(I_z = \frac{1}{12} m d^2 \right.$ RISPETTO BARICENTRO $\left. \right)$

$$I_{zO} = \underbrace{\frac{1}{12} m d^2 + m\left(\frac{d}{2}\right)^2}_{\text{Inerzia asta 1}} + \underbrace{\frac{1}{12} m d^2 + m\left(\frac{d}{2}\right)^2}_{\text{ASTA 2}}$$

$$+ \underbrace{\ldots}_{\text{ASTA 3 UGUALE}} + \underbrace{\ldots}_{\text{ASTA 4 UGUALE}}$$

$$I_{zO} = 4\left(\frac{1}{12} m d^2 + m\left(\frac{d}{2}\right)^2\right) = 1{,}28\ Kg\ m^2$$

$\left(I_z = I_{z\,BAR} + m r^2 \right)$

PUNTO P

$$I_{zP} = \underbrace{\frac{1}{12} m d^2}_{1} + \underbrace{2\left(\frac{1}{12} m d^2 + m \cdot \left(\frac{d}{2}\right)^2\right)}_{2 \text{ e } 4} + \ldots$$

$$\ldots + \underbrace{\frac{1}{12} m d^2 + m d^2}_{3}$$

$$\underbrace{}_{3}$$

$$I_{zp} = \frac{1+2+12+1+12}{12}\, m d^2 = \frac{\cancel{28}^{\cancel{14}\;7}}{\cancel{12}_{\cancel{6}\;3}}\, m d^2 = \frac{7}{3}\, m d^2$$

ALTRO MODO

$$I_{zp} = I_{zo} + M_{TOT}\cdot\left(\frac{d}{2}\right)^2$$

INERZIA QUADRATO RISPETTO O

$M_{TOT} = 4m$

DISTANZA BARICENTRO QUAD. e P

⇒ PUNTO O

$$= \frac{4}{3}\, m d^2 + \frac{4 m d^2}{4} = \frac{7}{3}\, m d^2$$

PUNTO Q   MODO I: CONSIDERO QUADRATO TOTALE

$$I_{zQ} = I_{zP} + 4m\left(\overline{QP}\right)^2 = \frac{7}{3} m d^2 + 4m\left(\frac{d}{2}\right)^2 = \frac{28+12}{12}\, m d^2 = \frac{10}{3}\, m d^2$$

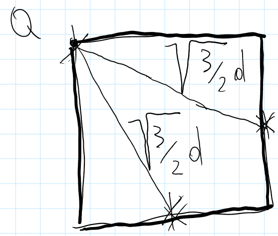
$$I_{zO} = I_{zO} + 4m\left(\overline{QO}\right)^2 = \ldots\ldots\ldots$$

MODO II: CONSIDERO SINGOLE ASTE

$$I_{zQ} = \underbrace{\frac{1}{12} m d^2 + m\left(\frac{d}{2}\right)^2}_{1} + \underbrace{\frac{1}{12} m d^2 + m\left(\frac{d}{2}\right)^2}_{4}$$

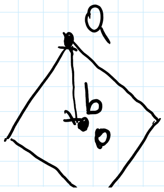
$$+ \underbrace{\frac{1}{12} m d^2 + m \frac{3}{2} d^2}_{2} + \underbrace{\frac{1}{12} m d^2 + m \frac{3}{2} d^2}_{3}$$

$$= \frac{10}{3}\, m d^2$$

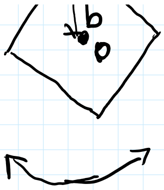


Fisso Q e lascio cadere

periodo piccole oscillazioni



b: distanza baricentro quadrato



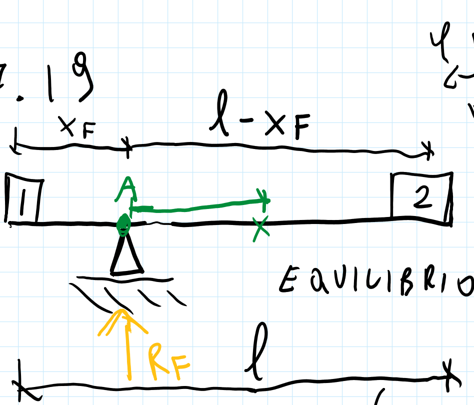
baricentro
quadrato
e
Q

$$T = \sqrt{\frac{I_z}{m \cdot g \cdot b}}$$

z perché w è sull'asse z

$$= \sqrt{\frac{3,2}{4 \cdot (1,5) \cdot 9,81 \cdot \left(\frac{0,8}{\sqrt{2}}\right)}} = 3,88 \, s$$

7.19



$R_F = ?$

$x_F = ?$

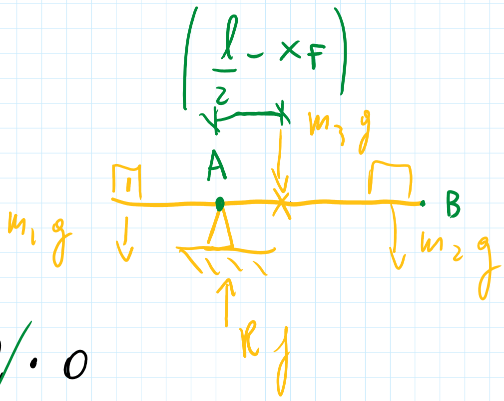
$(x_G = ?)$

m_3 = massa asta

EQUILIBRIO $\rightarrow$ $\begin{cases} \sum F = 0 \\ \sum M = 0 \end{cases}$

$$\sum F = 0 \rightsquigarrow m_1 \cdot g + m_2 \cdot g + m_3 \cdot g - R_F = 0$$

$$R_F = (m_1 + m_2 + m_3)\, g$$



$$\sum M_A = 0$$

$$-(m_1 g)\, x_F + (m_2 g) \cdot (l - x_F) + \cancel{R_f} \cdot 0$$

$$+ m_3 g \left(\frac{l}{2} - x_F\right) = 0$$

$$-m_1 g x_F + m_2 g l - m_2 g x_F + m_3 g \frac{l}{2} - m_3 g x_F = 0$$

$$x_F = \frac{m_2 g l + m_3 g \, l/2}{(m_1 + m_2 + m_3)\, g}$$

X_G BARICENTRO TOTALE?

$$X_G = \frac{-m_1 \cdot x_F + m_2 \cdot l + m_3 \cdot \left(\frac{l}{2} - x_F\right)}{m_1 + m_2 + m_3}$$

RISPETTO AD A

OPPURE RAGIONAMENTO

$\rightsquigarrow$ È IN EQUILIBRIO $\rightsquigarrow$ $\sum M = 0$

$$\sum M = -m_1 \cdot x_F + m_2 \cdot l + m_3 \left(\frac{l}{2} - x_F\right)$$

$$= m_{TOT} \cdot d_{\text{BARICENTRO - PUNTO RIFERIMENTO}}$$

$$M_{TOT} = m_{TOT} \cdot d_{\text{BAR - PUNTO RIF.}} = 0$$

$m_{TOT} \neq 0$

$d = 0 \rightarrow$ DISTANZA A e BARICENTRO $= 0$

$\Downarrow$

BARICENTRO IN A