6.5 Marcin Porębska (20) 2c

A

$m_t = 0{,}5\,kg$ – masa tarczy

$m_o = 0{,}2\,kg$ – masa odważnika

$r = 0{,}22\,m$ – promień tarczy

a) $L = J\omega \qquad \omega = \frac{2\pi}{T}$

Moment bezwładności

Tarcza: $J_t = \frac{1}{2} m_t r^2$

Odważnik: $J_o = m \cdot r^2$

J_c = Tarcza + Odważnik: $\frac{1}{2} m_t r^2 + m_o r^2 = J_c$

$L_1 = J_t \omega_1$

$L_1 = \frac{1}{2} m_t r^2 \cdot \frac{2\pi}{T_1}$

$L_1 = \frac{\pi m_t r^2}{T_1}$

$L_2 = J_c \omega_2$

$L_2 = \left(\frac{1}{2} m_t r^2 + m_o r^2\right) \cdot \frac{2\pi}{T_2}$

$L_2 = \frac{\pi (m_t + 2m_o) r^2}{T_2}$

$L_1 = L_2$

$\frac{\pi m_t r^2}{T_1} = \frac{\pi (m_t + 2m_o) r^2}{T_2} \quad / \cdot T_1 T_2$

$m_t T_2 = (m_t + 2m_o) T_1 \quad / : m_t T_1$

$\frac{T_2}{T_1} = \frac{m_t + 2m_o}{m_t}$

$\frac{T_2}{T_1} = 1 + \frac{2m_o}{m_t}$

$\frac{T_2}{T_1} = 1 + \frac{2 \cdot 0{,}2\,kg}{0{,}5\,kg} = 1 + 0{,}8 = \underline{1{,}8}$

b) $L_1 = J_c \omega_1$

$L_1 = \left(\frac{1}{2} m_t r^2 + m_0 r^2\right) \cdot \frac{2\pi}{T_1}$

$L_1 = \frac{\pi (m_t r^2 + 2 m_0 r^2)}{T_1}$

$L_0 = J_0 \omega_1$

$L_0 = m_0 r^2 \cdot \frac{2\pi}{T_1}$

$L_0 = \frac{2\pi m_0 r^2}{T_1}$

$L_t = J_t \omega_2$

$L_t = \frac{1}{2} m_t r^2 \cdot \frac{2\pi}{T_2}$

$L_t = \frac{\pi m_t r^2}{T_2}$

$L_1 = L_0 + L_t$ — zasada momentu pędu

$\frac{\pi (m_t + 2m_0) r^2}{T_1} = \frac{2 \pi m_0 r^2}{T_1} + \frac{\pi m_t r^2}{T_2} \quad / \cdot T_1 T_2$

$\frac{(m_t + 2m_0) T_1 T_2}{T_1} = \frac{2 m_0 T_1 T_2}{T_1} + \frac{m_t T_1 T_2}{T_2}$

$(m_t + 2m_0) T_2 = 2 m_0 T_2 + m_t T_1$

$m_t T_2 + 2 m_0 T_2 = 2 m_0 T_2 + m_t T_1$

$m_t T_2 = m_t T_1$

$T_2 = T_1$

w tej sytuacji okres obrotu na ulegnie zmianie