

$$\underline{I_{wh}} = \underline{mr^2} = 343 \times 10^{-5}$$

$$I_n = \frac{1}{12} M L_x^2 = 1.081 \times 10^{-3}$$

$$\begin{aligned} I_{mc} &= 4 \{ m(l_x^2 + l_z^2) + I_{wh} \} + I_n \\ &= 4m(l_x^2 + l_z^2 + r^2) + \frac{1}{12} M L_x^2 \\ &= 1.089 \times 10^{-2} \end{aligned}$$

$$M = 0.192 \text{ kg}$$

$$m = 0.028 \text{ kg}$$

$$r = 0.035 \text{ m}$$

$$l_x = 0.038 \text{ m} \quad l_y = 0.015 \text{ m} \quad l_z = 0.015 \text{ m}$$

$$L_x = 0.26 \text{ m} \quad L_y = 0.15 \text{ m}$$

$$L = I\omega$$

$$L_{mc} = I_{mc} \omega_{mc}$$

$$L_{mf} = I_{mf} \omega_f$$

$$L_{mb} = I_{mb} \omega_b$$

$$L_n = 0$$

$$\begin{aligned} L_{mc} &= L_n + 2L_{mf} + 2L_{mb} \\ &= 0 + 2(I_{mf} \omega_f + I_{mb} \omega_b) \\ &= 4mr^2(\omega_f + \omega_b) \\ &= \left\{ 4m(l_x^2 + l_z^2 + r^2) + \frac{1}{12} M L_x^2 \right\} \omega_{mc} \\ \omega_{mc} &= \frac{4mr^2(\omega_f + \omega_b)}{4m(l_x^2 + l_z^2 + r^2) + \frac{1}{12} M L_x^2} \end{aligned}$$

$$\begin{aligned} \theta_{mc} &= \frac{4mr^2(\omega_f + \omega_b)}{4m(l_x^2 + l_z^2 + r^2) + \frac{1}{12} M L_x^2} \cdot t \\ &\Rightarrow k(\omega_f + \omega_b)t \end{aligned}$$

$$k = \frac{6.86 \times 10^{-5}}{1.966 \times 10^{-3}} = 3.489 \times 10^{-2}$$

$$\frac{1}{2} \omega_{mc} = 3.49 \times 10^{-2} \cdot \frac{(\omega_f + \omega_b)}{2}$$

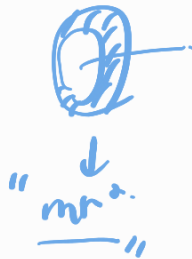
$$\omega_{mc} : \frac{(\omega_f + \omega_b)}{2} = 0.349 : 5$$

$$\Rightarrow 3.49 : 50$$

$$k = \frac{1.372 \times 10^{-4}}{1.089 \times 10^{-2}} = 1.259 \times 10^{-2}$$

$$\frac{1}{2} \omega_{mc} = 1.259 \times 10^{-2} \cdot \frac{(\omega_f + \omega_b)}{2}$$

$$\begin{aligned} \omega_{mc} : \frac{(\omega_f + \omega_b)}{2} &= 0.1259 : 5 \\ &= 1.259 : 50 \end{aligned}$$



$$\omega_{mc} : \frac{(\omega_f + \omega_b)}{2} = \square : \Delta$$

