$I_{wh} = mr^2 = 3.43 \times 10^{-5}$

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

$I_{mc} = 4\{m(l_x^2 + l_z^2) + I_{wh}\} + I_M$

$= 4m(l_x^2 + l_z^2 + r^2) + \frac{1}{12} M L_x^2$

$= 1.089 \times 10^{-2}$

$L = I\omega$

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

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

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

$L_M = 0$

$L_{mc} = L_M + 2L_{mf} + 2L_{mb}$

$= 0 + 2(I_{mf}\omega_f + I_{mb}\omega_b)$

$= 4mr^2(\omega_f + \omega_b)$

$= \{4m(l_x^2 + l_z^2 + r^2) + \frac{1}{12} M L_x^2\}\,\omega_{mc}$

$$\omega_{mc} = \frac{4mr^2(\omega_f + \omega_b)}{4m(l_x^2 + l_z^2 + r^2) + \frac{1}{12} M L_x^2}$$

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

$\Rightarrow k\,(\omega_f + \omega_b)\,t$

$M = 0.192\,kg$

$m = 0.028\,kg$

$r = 0.035\,m$

$l_x = 0.038\,m$

$L_x = 0.26\,m$

$l_y = 0.015\,m$

$L_y = 0.15\,m$

$l_z = 0.015\,m$

"mr^2"

$\omega_{m_c} : \frac{(\omega_f + \omega_b)}{2} = \square : \triangle$

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

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

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

$\cancel{\Rightarrow 3.49 : 50}$

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

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

$\omega_{mc} : \frac{(\omega_f + \omega_b)}{2} = 0.1259 : 5$

$= 1.259 : 50$