Résumé d'inertie

(Q1) $\dot{\alpha} = -\frac{R}{r}\dot{\theta}$

(Q2) $\vec{\sigma}(G, 2/1) = C_2(\dot{\alpha}+\dot{\theta})\vec{z_1} = C_2\dot{\theta}\left(1-\frac{R}{r}\right)\vec{z_1}$

$\vec{R_c} = m_2.(R-r).\dot{\theta}.\vec{x_i}$

(Q3) $\boxed{\vec{R_d} = m_2.(R-r).\left[\ddot{\theta}\,\vec{x_i} + \dot{\theta}^2\,\vec{y_i}\right]}$

$\vec{\delta}(G, 2/1) = C_2\ddot{\theta}\left(1-\frac{R}{r}\right).\vec{z_1}$

$\vec{\delta}(\Pi, 2/1) = \vec{\delta}(G, 2/1) + \vec{\Pi G} \wedge \vec{R_d} = \vec{\delta}(G, 2/1) + r.\vec{y_i} \wedge \vec{R_d}$

$= \ldots \quad \cancel{=} - m_2(R-r)\,r\,\ddot{\theta}\,\vec{z_1}$

$= C_2\ddot{\theta}\left(1-\frac{R}{r}\right)\vec{z_1} + m_2.r^2\left(1-\frac{R}{r}\right)\ddot{\theta}\,\vec{z_1}$

$\boxed{\vec{\delta}(\Pi, 2/1) = \left(C_2 + m_2.r^2\right)\left(1-\frac{R}{r}\right).\ddot{\theta}.\vec{z_1}}$

(Q4) $\boxed{\{\tau_{1\to 2}\} = \begin{Bmatrix} X & 0 \\ Y & 0 \\ 0 & 0 \end{Bmatrix}_{\Pi}}$ (Q5) $\{\tau_{1\to 2}\}_{\Pi} + \{\tau_{pes\to 2}\}_{\Pi} = \{\mathcal{D}\,2/1\}_{\Pi}$

$\vec{P} = -m_2.g.\vec{y_1} = -m_2.g.(\sin\theta\,\vec{x_i} + \cos\theta\,\vec{y_i})$

$\vec{\Pi}(\Pi) = \vec{\Pi}(G) + \vec{\Pi G} \wedge \vec{P} = \vec{0} + r.\vec{y_i} \wedge \vec{P} = m_2.g.r\sin\theta\,\vec{z_1}$

$$\boxed{\begin{aligned} X - m_2 g \sin\theta &= m_2(R-r)\ddot{\theta} \\ Y - m_2 g \cos\theta &= m_2(R-r)\dot{\theta}^2 \\ m_2 g r \sin\theta &= \left(C_2 + m_2 r^2\right)\left(1-\frac{R}{r}\right)\ddot{\theta} \end{aligned}}$$

rem : $1-\frac{R}{r} < 0$

(Q6) $\sin\theta \simeq \theta \implies \left(C_2 + m_2 r^2\right)\left(\frac{R}{r}-1\right)\ddot{\theta} + m_2 g r \theta = 0$

$\ddot{\theta} + \underbrace{\frac{m_2 g r^2}{(C_2 + m_2 r^2)(R-r)}}_{\omega^2}\theta = 0 \qquad T = \frac{2\pi}{\omega} = \ldots$

(Q7) à $t = 0$, $\theta = \theta_0$, $\dot{\theta} = 0$ ~~$\Rightarrow \cos\theta$~~

$X_0 = m_2 g \sin\theta_0 + m_2(R-r)\ddot{\theta}$

$Y_0 = m_2 g \cos\theta_0$

avec $\ddot{\theta} = \ldots$

$\implies$ on vérifie que $\frac{X_0}{Y_0} < f$.