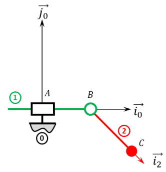
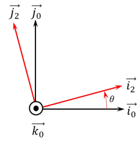
Mouvement TR ★

C2-08

C2-09





Question 1 Exprimer le torseur dynamique $\left\{\mathscr{D}\left(2/0\right)\right\}$ en B.

Expression de la résultante dynamique $\overrightarrow{R_d\left(2/0\right)} = m_2\overrightarrow{\Gamma\left(G_2,2/0\right)} = m_2\dfrac{\mathrm{d}^2}{\mathrm{d}t^2}\left[\overrightarrow{AC}\right]_{\mathscr{R}_0}$

$\dfrac{\mathrm{d}^2}{\mathrm{d}t^2}\left[\overrightarrow{AC}\right]_{\mathscr{R}_0} = \dfrac{\mathrm{d}^2}{\mathrm{d}t^2}\left[\overrightarrow{AB}\right]_{\mathscr{R}_0} + \dfrac{\mathrm{d}^2}{\mathrm{d}t^2}\left[\overrightarrow{BC}\right]_{\mathscr{R}_0} = \ddot{\lambda}(t)\overrightarrow{i_0} + R\dfrac{\mathrm{d}^2}{\mathrm{d}t^2}\left[\overrightarrow{i_2}\right]_{\mathscr{R}_0} = \ddot{\lambda}(t)\overrightarrow{i_0} + R\dfrac{\mathrm{d}}{\mathrm{d}t}\left[\dot{\theta}\overrightarrow{j_2}\right]_{\mathscr{R}_0}$
$= \ddot{\lambda}(t)\overrightarrow{i_0} + R\left(\ddot{\theta}\overrightarrow{j_2} - \dot{\theta}^2\overrightarrow{i_2}\right)$.

Méthode 1 : Calcul en $G_2 = C$ puis déplacement du torseur dynamique

- Calcul du moment cinétique en G_2 : $G_2 = C$ est le centre de gravité donc $\overrightarrow{\sigma\left(C,2/0\right)} = I_C\left(2\right)\dot{\theta}\overrightarrow{k_0} = C_1\dot{\theta}\overrightarrow{k_1}$.
- Calcul du moment dynamique en G_2 : $G_2 = C$ est le centre de gravité donc $\overrightarrow{\delta\left(C,2/0\right)} = \dfrac{\mathrm{d}}{\mathrm{d}t}\left[\overrightarrow{\sigma\left(C,2/0\right)}\right]_{\mathscr{R}_0} = C_1\ddot{\theta}\overrightarrow{k_1}$.
- Calcul du moment dynamique en B : $\overrightarrow{\delta\left(B,2/0\right)} = \overrightarrow{\delta\left(C,2/0\right)} + \overrightarrow{BC} \wedge \overrightarrow{R_d\left(2/0\right)} = C_1\ddot{\theta}\overrightarrow{k_1} + R\overrightarrow{i_2}m_2 \wedge \left(\ddot{\lambda}(t)\overrightarrow{i_0} + R\left(\ddot{\theta}\overrightarrow{j_2} - \dot{\theta}^2\overrightarrow{i_2}\right)\right) = C_1\ddot{\theta}\overrightarrow{k_1} + Rm_2\left(-\sin\theta\ddot{\lambda}(t)\overrightarrow{k_0} + R\ddot{\theta}\overrightarrow{k_2}\right)$.

Au final, on a donc $\left\{\mathscr{D}\left(2/0\right)\right\} = \left\{\begin{array}{l} m_2\left(\ddot{\lambda}(t)\overrightarrow{i_0} + R\left(\ddot{\theta}\overrightarrow{j_2} - \dot{\theta}^2\overrightarrow{i_2}\right)\right) \\ C_1\ddot{\theta}\overrightarrow{k_1} + Rm_2\left(-\sin\theta\ddot{\lambda}(t)\overrightarrow{k_0} + R\ddot{\theta}\overrightarrow{k_2}\right) \end{array}\right\}_B$.

Question 2 Déterminer $\overrightarrow{R_d\left(1+2/0\right)} \cdot \overrightarrow{i_0}$

On a $\overrightarrow{R_d\left(1+2/0\right)} = \overrightarrow{R_d\left(1/0\right)} + \overrightarrow{R_d\left(2/0\right)} = m_1\ddot{\lambda}(t)\overrightarrow{i_0} + m_2\left(\ddot{\lambda}(t)\overrightarrow{i_0} + R\left(\ddot{\theta}\overrightarrow{j_2} - \dot{\theta}^2\overrightarrow{i_2}\right)\right)$.

On projette alors sur $\overrightarrow{i_0}$, $\overrightarrow{R_d\left(1+2/0\right)} \cdot \overrightarrow{i_0} = m_1\ddot{\lambda}(t) + m_2\left(\ddot{\lambda}(t) - R\left(\ddot{\theta}\sin\theta(t) + \dot{\theta}^2\cos\theta\right)\right)$.