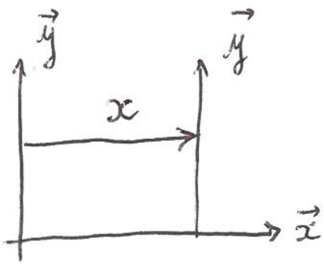

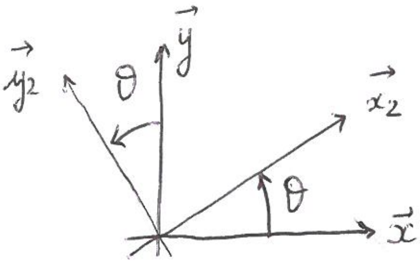

Q1.1

$\overrightarrow{Rd}(1/0) = m_1 . \ddot{x}\ \vec{x}$ /1

$\overrightarrow{Rd}(2/0) = m_2 \left(\ddot{x}\ \vec{x} + \ell \ddot{\theta}\ \vec{x_2} + \ell \dot{\theta}^2 \vec{y_2} \right)$ /2

Q1.2

$\vec{\delta}_A(1/0) = \vec{\delta}_{G_1}(1/0) = \vec{0}$ (mouvement de translation) /1

$\vec{\delta}_A(2/0) = \underbrace{\vec{\delta}_{G_2}(2/0)}_{= \vec{0}} + \left\{ \overrightarrow{AG_2} \wedge \overrightarrow{Rd}(2/0) \right\}$

masse ponctuelle

$- \ell \vec{y_2} \wedge m_2 (\ddot{x}\ \vec{x} + \ell \ddot{\theta}\ \vec{x_2} + \ell \dot{\theta}^2 \vec{y_2})$

$(m_2 \ell \ddot{x} \cos\theta + m_2 \ell^2 \ddot{\theta})\ \vec{z}$ /2,5

Q2.1

* une composante suivant $-\vec{y_2}$ /0,5

* $A_2 = 7{,}01\ kg\,m^2$ $B_2 = 8{,}11\ kg\,m^2$ $C_2 = 14\ kg\,m^2$ /0,5

$D_2 = E_2 = F_2 = 0$ car 2 plans de symetrie $\perp$ $G_2 \vec{x_2} \vec{y_2}$ et $G_2 \vec{y_2} \vec{z_2}$ /1

* Theorème d'Huyghens

$[I_{A}(2)] = [I_{G_2}(2)] + [I_{A}(G_2)]$ $\overrightarrow{AG_2} \begin{pmatrix} 0 \\ -0{,}09 \\ 0 \end{pmatrix}$

$J_{Ax_2} = J_{Ox_2} + \underbrace{M_2 (0{,}09)^2}_{2{,}12\ kg\,m^2}$ $J_{Az_2} = J_{G_2 z_2} + \underbrace{M_2 (0{,}09)^2}_{2{,}12\ kg.m^2}$ /2

* (1) a donc une matrice diagonale /0,5

Q2.2

$\overrightarrow{Rd}(1+2/0) = \overrightarrow{Rd}(1/0) + \overrightarrow{Rd}(2/0)$

$M_1 (\ddot{x}\ \vec{x} + \ddot{y}\ \vec{y})$ /1

$M_2 \left(\ddot{x}\ \vec{x} + \ddot{y}\ \vec{y} + e(\ddot{\alpha} + \ddot{\beta})\ \vec{x_2} + e(\dot{\alpha} + \dot{\beta})^2\ \vec{y_2} \right)$ /1,5

il faut $\ddot{y} = 0$ $\theta = \alpha + \beta$ et $M_2 e = m_2 \ell$ /1

Q2.3

$$\vec{\sigma}_{A(1/0)} = [I_{A(1)}]\,\vec{\Omega}_{1/0} = C_1\,\dot{\alpha}\,\vec{z} \qquad /1$$

$$\vec{\delta}_{A(1/0)} = C_1 . \ddot{\alpha}\,\vec{z} \qquad /1$$

Q2.4

$$\vec{\sigma}_{G_2,2/0} = [I_{G_2(2)}]\,\vec{\Omega}_{2/0} = C_2(\dot{\alpha}+\dot{\beta})\vec{z}$$

$$\vec{\sigma}_{A,2/0} = \vec{\sigma}_{G_2,2/0} + \underbrace{\left(\vec{AG_2} \wedge m_2 \vec{V}_{G_2,2/0}\right)}_{-e\vec{y_2} \wedge m_2(\dot{x}\vec{x} + \dot{y}\vec{y} + e(\dot{\alpha}+\dot{\beta})\vec{x_2})}$$

$$\vec{\sigma}_{A,2/0} = \vec{z}\left(C_2(\dot{\alpha}+\dot{\beta}) + M_2 e \dot{x} \cos(\alpha+\beta) + m_2 e \dot{y} \sin(\alpha+\beta) + m_2 e^2(\dot{\alpha}+\dot{\beta}\right. \qquad /1,5$$

$$\vec{\delta}_{G_2,2/0} = C_2(\ddot{\alpha}+\ddot{\beta})\vec{z}$$

$$\vec{\delta}_{A,2/0} = \vec{\delta}_{G_2,2/0} + \underbrace{\left(\vec{AG_2} \wedge \vec{Rd}(2/0)\right)}_{-e\vec{y_2} \wedge M_2(\ddot{x}\vec{x} + \ddot{y}\vec{y} + e(\ddot{\alpha}+\ddot{\beta})\vec{x_2} + e(\dot{\alpha}+\dot{\beta})^2\vec{y_2})}$$

$$\vec{\delta}_{A,2/0} = \vec{z}\left(C_2(\ddot{\alpha}+\ddot{\beta}) + M_2 e \ddot{x} \cos(\alpha+\beta) + M_2 e \ddot{y} \sin(\alpha+\beta) + M_2 e^2(\ddot{\alpha}+\ddot{\beta})\right) \qquad /2$$

Q2.5

$$\ddot{y} = 0 \qquad \theta = \alpha+\beta \qquad m_2 \ell = M_2 e$$

$$(C_2 + M_2 e^2) = m_2 \ell^2 \qquad \ell = \left(\frac{C_2 + M_2 e^2}{M_2 . e}\right)$$

$$m_2 = \left(\frac{M_2^2 . e^2}{C_2 + M_2 . e^2}\right) \qquad /1$$

0,5