EXO1 : TD1

1°/ Torseurs correspondant à chaque action : (1)

$$\left\{ \text{rotor pal} \rightarrow S \right\} = \left\{ \begin{matrix} \vec{F} \\ \vec{M} \end{matrix} \right\}_A = \left\{ \begin{matrix} \vec{F} \\ \vec{M} + \vec{F} \wedge \vec{AG} \end{matrix} \right\}_G$$

$$\left\{ \text{rotor a.c} \rightarrow S \right\} = \left\{ \begin{matrix} \vec{Q} \\ \vec{M_Q} \end{matrix} \right\}_B = \left\{ \begin{matrix} \vec{Q} \\ \vec{M_Q} + \vec{Q} \wedge \vec{BG} \end{matrix} \right\}_G$$

$$\left\{ \text{pesanteur} \rightarrow S \right\} = \left\{ \begin{matrix} m\vec{g} \\ \vec{0} \end{matrix} \right\}_G$$

$$\left\{ \text{resultante air} \rightarrow S \right\} = \left\{ \begin{matrix} \vec{\mathcal{R}} \\ \vec{0} \end{matrix} \right\}_C = \left\{ \begin{matrix} \vec{\mathcal{R}} \\ \vec{\mathcal{R}} \wedge \vec{CG} \end{matrix} \right\}_G$$

2°/ PFS $\Rightarrow$ $\left\{ \begin{matrix} \vec{F} \\ \vec{M} \end{matrix} \right\}_G = \left\{ \begin{matrix} \vec{0} \\ \vec{0} \end{matrix} \right\}$

Soit
$$\begin{cases} \vec{F} + \vec{Q} + m\vec{g} + \vec{\mathcal{R}} = \vec{0} \quad \dots (1) \\ \vec{M} + \vec{F} \wedge \vec{AG} + \vec{M_Q} + \vec{Q} \wedge \vec{BG} + \vec{\mathcal{R}} \wedge \vec{CG} = \vec{0} \quad \dots (2) \end{cases}$$

$$(1) \Rightarrow \begin{cases} F_x + \mathcal{R} = 0 \\ F_y + Q = 0 \\ F_z - mg = 0 \Rightarrow F_z = 3\,10^4\,N \end{cases}$$

$$(2) \Rightarrow \begin{vmatrix} 0 \\ 0 \\ M \end{vmatrix} + \begin{vmatrix} F_x \\ F_y \\ F_z \end{vmatrix} \wedge \begin{vmatrix} AG_x \\ 0 \\ AG_z \end{vmatrix} + \begin{vmatrix} 0 \\ M_Q \\ 0 \end{vmatrix} + \begin{vmatrix} 0 \\ Q \\ 0 \end{vmatrix} \wedge \begin{vmatrix} BG_x \\ 0 \\ BG_z \end{vmatrix} + \begin{vmatrix} \mathcal{R} \\ 0 \\ 0 \end{vmatrix} \wedge \begin{vmatrix} CG_x \\ 0 \\ 0 \end{vmatrix} = \begin{vmatrix} 0 \\ 0 \\ 0 \end{vmatrix}$$

TD 1

EXO 1

$F_y\, AG_z + Q\, BG_z = 0 \iff F_y(AG_z - BG_z) = 0$

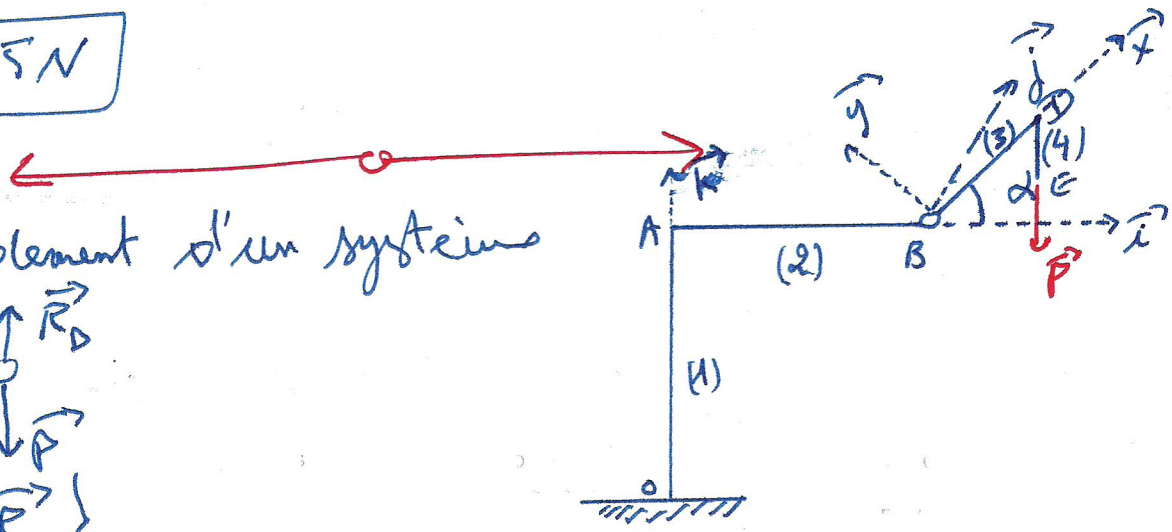
$F_z\, AG_x - F_x\, AG_z + M_Q = 0 \iff F_x = \dfrac{F_z\, AG_x + M_Q}{AG_z} = \dfrac{3\,|0,4|(-0,2) - 3}{-1,5}$ (2)

$\Rightarrow$ **$F_x = 4002\,N$**

$M - F_y\, AG_x - Q\, BG_x = 0 \Rightarrow M - F_y(AG_x + BG_x) = 0$

$\Rightarrow F_y = \dfrac{M}{AG_x + BG_x} = \dfrac{400}{-0,2-4} = -95,2\,N$

$\Rightarrow$ **$Q = 95\,N$**



EXO 2 : isolement d'un système

act° en D :

$\{P \to 4\} = \left\{ \begin{matrix} \vec{P} \\ \vec{0} \end{matrix} \right\}_E$

$\{3 \to 4\} = \left\{ \begin{matrix} \vec{R_D} \\ \vec{0} \end{matrix} \right\}_D = \left\{ \begin{matrix} \vec{R_D} \\ \vec{R_D} \wedge \vec{DE} \\ \vec{0} \end{matrix} \right\}_E$

PFS $\quad \left\{ \begin{matrix} \vec{P} + \vec{R_D} = \vec{0} \\ \vec{0} = \vec{0} \end{matrix} \right. \Rightarrow \vec{R_D} = -\vec{P} \Rightarrow$ **$R_D = 10\,kN$**

act° en B :

$\{4 \to 3\} = \left\{ \begin{matrix} \vec{P} \\ \vec{0} \end{matrix} \right\}_D = \left\{ \begin{matrix} \vec{P} \\ \vec{P} \wedge \vec{DB} \end{matrix} \right\}_B$

$\{pes \to 3\} = \left\{ \begin{matrix} m_3 \vec{g} \\ \vec{0} \end{matrix} \right\}_{G_3} = \left\{ \begin{matrix} m_3 \vec{g} \\ m_3 \vec{g} \wedge \vec{G_3 B} \end{matrix} \right\}_B$

$\{2 \to 3\} = \left\{ \begin{matrix} \vec{R_B} \\ \vec{M_B} \end{matrix} \right\}_B$