Corrigé Examen mécanique rationnelle

Exercice 1 *(4.0pts)*

Partie 1 $\vec{A} = -5\vec{\imath} - 2\vec{\jmath} + 2\vec{k}$; $\vec{B} = 2\vec{\imath} + 3\vec{\jmath} - \vec{k}$

$\vec{A}.\vec{B} = \big((-5).2\big) + \big((-2).3\big) + \big(2.(-1)\big) = -18$ *(1.5pts)*

$\vec{A}\,\mathrm{X}\,\vec{B} = \big(-5\vec{\imath} - 2\vec{\jmath} + 2\vec{k}\big)\mathrm{X}\big(2\vec{\imath} + 3\vec{\jmath} - \vec{k}\big)$

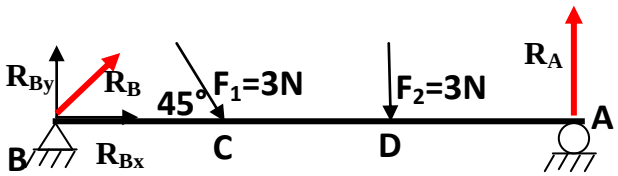
$\vec{A}X\vec{B} = \begin{vmatrix} \vec{\imath} & -\vec{\jmath} & \vec{k} \\ -5 & -2 & 2 \\ 2 & 3 & -1 \end{vmatrix}$ *(0.5pts)*

$\vec{A}\,\mathrm{X}\,\vec{B} = \big[\big((-2).(-1)\big) - (3.2)\big]\vec{\imath} - [(-5).(-1) - (2.2)]\vec{\jmath} + [\big((-5).3\big) - \big(2.(-2)\big)]\vec{k}$ *(1.5pts)*

$\vec{A}\,\mathrm{X}\,\vec{B} = -4\vec{\imath} + \vec{\jmath} - 11\vec{k}$ *(0.5pts)*

Partie 2 *(8.0pts)*

1- *(0,5pt)*



2-*(2pts)*

$\vec{R}_A\begin{pmatrix}0\\RA\end{pmatrix}$; $\vec{R}_B\begin{pmatrix}R_{Bx}\\R_{By}\end{pmatrix}$; $\vec{F}_2\begin{pmatrix}0\\-F_2\end{pmatrix}$, $\vec{F}_1\begin{pmatrix}F_1Cos45\\-F_1sin45\end{pmatrix}$

3- *(2pts)*

$\vec{M}_{\frac{RA}{B}} = \overrightarrow{BA}X\vec{R}_A = \begin{vmatrix}3 & 0\\0 & R_A\end{vmatrix} = 3R_A$

$\vec{M}_{\frac{F_1}{B}} = \overrightarrow{BC}X\vec{F}_1 = \begin{vmatrix}1 & 0\\F_1Cos45 & -F_1sin45\end{vmatrix} = -1.F_1sin45 = -3.\frac{\sqrt{2}}{2} = -2.12\ N.m$

$\vec{M}_{\frac{F2}{B}} = \overrightarrow{BD}X\vec{F}_2 = \begin{vmatrix}2 & 0\\0 & -F_2\end{vmatrix} = -2F_2 = -6\ N.m$

$\vec{M}_{\frac{RB}{B}} = \overrightarrow{BB}X\vec{R}_B = 0$

4- *(0,5 pts)*

$\sum\overrightarrow{F_{ext}} = \overrightarrow{0}; \sum\overrightarrow{M/B} = \overrightarrow{0};$

5- *(1.50 pts)*

Axe OX: $R_{Bx} + F_1Cos45 = 0\ (\mathbf{1})$ …. $R_{Bx} = -3\frac{\sqrt{2}}{2} = -2.12\ N$

Axe OY: $R_A + R_{By} - F_2 - F_1 sin45 = 0$ **(2)**

$\sum M/_B = 0 \ldots\ldots 3R_A - 3.\frac{\sqrt{2}}{2} - 6 = 0$ **(3)**

6- ***(1.50 pts)***

De (1): $R_{Bx} = -3\frac{\sqrt{2}}{2} = -2.12\ N$; *de* (3) $R_A = \frac{\sqrt{2}}{2} + 2 = 2.71\ N$;

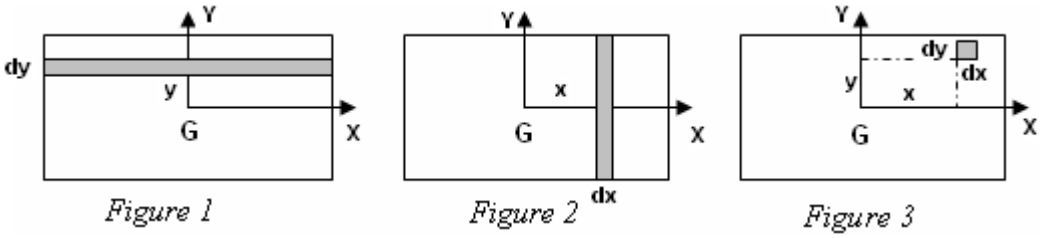
on remplace dans (2) $R_{By} = 3 + 3\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} - 2 = 1 + \sqrt{2} = 2.41\ N$

Exercice 2 *(8.0pts)*

1-

(1pt) *Z=0 (surface) ;* $dm = \sigma dS = \frac{M}{ab} adx = \frac{M}{b} dx = \frac{M}{ab} bdy = \frac{M}{a} dy$

(2pt)



(1 pt) $I_{xx} = \int_0^a (y^2)\frac{M}{a} dy = \frac{Ma^2}{3}$

(1 pt) $I_{yy} = \int_0^b (x^2)\frac{M}{b} dx = \frac{Mb^2}{3}$

(1pt) $I_{zz} = I_{xx} + I_{yy} = \frac{M}{3}(a^2 + b^2)$

(1 pt) $I_{xz} = I_{yz} = 0$

$I_{XY} = \int_S xydm = \frac{M}{ab}\int_0^b xdx \int_0^a ydy = \frac{M}{ab}\left((b)^2\right)\left((a)^2\right) = Mab.$ ***(1 pt)***