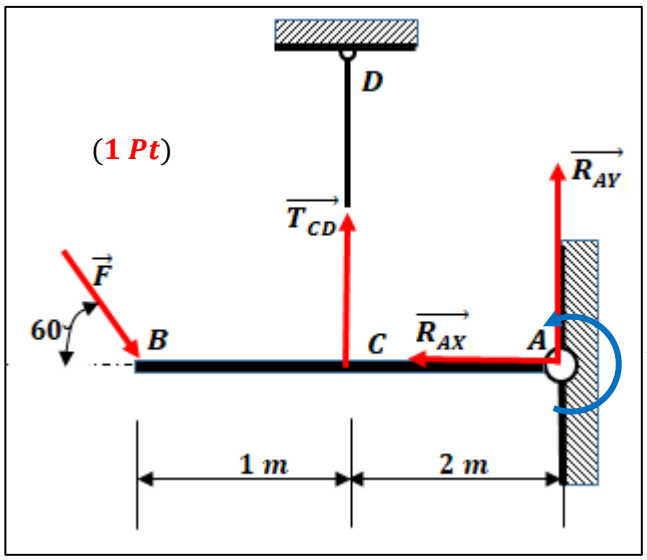
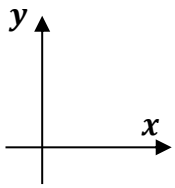
CORRECTION du DEVOIR à DOMICILE
MECANIQUE RATIONNELLE

Exercice 01 : (06 Pts)





Isoler la barre AB :

$\overrightarrow{R_A} + \vec{F} + \overrightarrow{T_{CD}} = \vec{0}$

$\sum F/x = F.cos\ 60^o - R_{AX} = 0$ **(1)** (0,5 Pt)

$\sum F/y = -F.sin\ 60^o + T_{CD} + R_{AY} = 0$ **(2)** (0,5 Pt)

$\sum = MF/Az = F\ sin\ 60^o \times 3 - T_{CD} \times 2 = 0$ **(3)** (1 Pt)

De l'équation (1), on tire :

$R_{AX} = F.cos\ 60^o = 30\ cos\ 60^o = 15\ (N)$ (0,5 Pt)

De l'équation (3), on tire :

$T_{CD} = F\ sin\ 60^o \times 3/2 = 30\ sin\ 60^o \times 3/2 = 38,97\ (N)$ (1 Pt)

De l'équation (2), on tire :

$R_{AY} = F.sin\ 60^o - T_{CD} = 30\ sin\ 60^o - 38,97 = -12,99\ (N)$ (0,5 Pt)

NB : le vecteur force $\overrightarrow{R_{AY}}$ est dirigé dans le sens opposé.

$R_A = \sqrt{{R_{AX}}^2 + {R_{AY}}^2} = \sqrt{15^2 + (-12,99)^2} = 20\ (N)$ (1 Pt)

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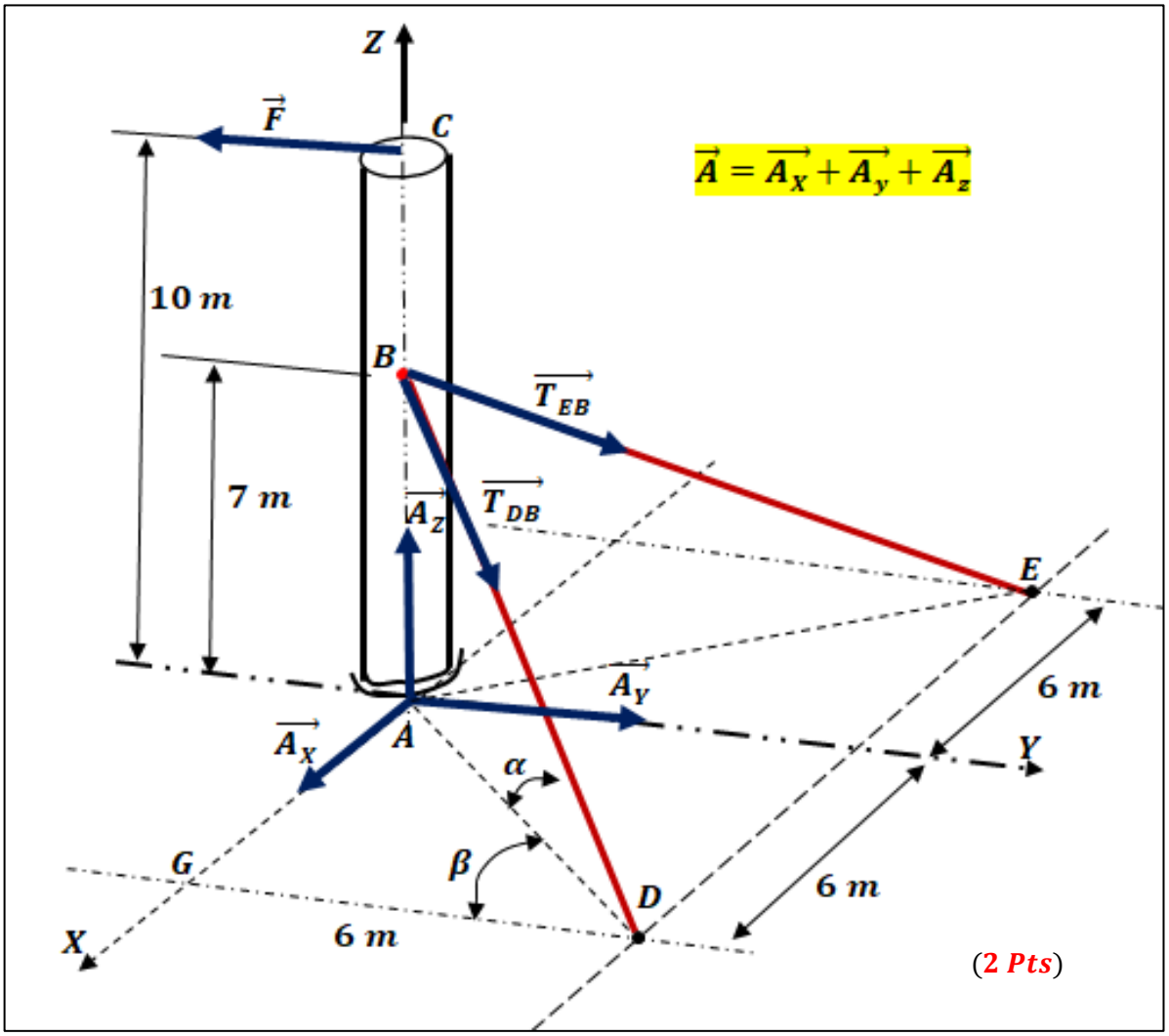
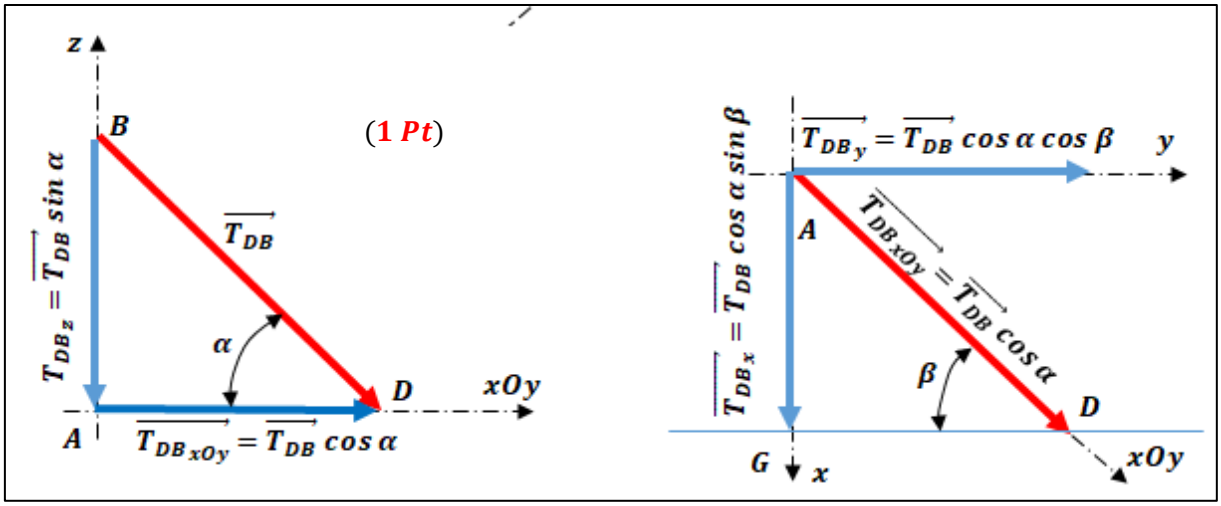
EXERCICE 02 : (09 Pts)





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Forces	$\overrightarrow{A_X}$	$\overrightarrow{A_Y}$	$\overrightarrow{A_Z}$	$\vec{F}$	$\overrightarrow{T_{EB}}$	$\overrightarrow{T_{DB}}$		**EQ**
$\sum F_X =$	$+A_X$	$+0$	$+0$	$+0$	$-T_{EB}\cos\alpha\sin\beta$	$+T_{DB}\cos\alpha\sin\beta$	$=0$	(1)
$\sum F_Y =$	$+0$	$+A_Y$	$+0$	$-F$	$+T_{EB}\cos\alpha\cos\beta$	$+T_{DB}\cos\alpha\cos\beta$	$=0$	(2)
$\sum F_Z =$	$+0$	$+0$	$+A_Z$	$+0$	$-T_{EB}\sin\alpha$	$-T_{DB}\sin\alpha$	$=0$	(3)
$\sum MF_X =$	$+0$	$+0$	$+0$	$+F\times AC$	$+0$ $-T_{EB}\cos\alpha\cos\beta\times AB$ $+0$	$+0$ $-T_{DB}\cos\alpha\cos\beta\times AB$ $+0$	$=0$	(4)
$\sum MF_Y =$	$+0$	$+0$	$+0$	$+0$	$-T_{EB}\cos\alpha\sin\beta\times AB$ $+0$ $+0$	$+T_{DB}\cos\alpha\sin\beta\times AB$ $+0$ $+0$	$=0$	(5)
$\sum MF_Z =$	$+0$	$+0$	$+0$	$+0$	$+0+0+0$	$+0+0+0$	$=0$	(6)

$\sum F_X = +A_X - T_{EB}\cos\alpha\sin\beta + T_{DB}\cos\alpha\sin\beta = 0$ **(1)** (1 Pt)

$\sum F_Y = +A_Y - F + T_{EB}\cos\alpha\cos\beta + T_{DB}\cos\alpha\cos\beta = 0$ **(2)** (1 Pt)

$\sum F_Z = +A_Z - T_{EB}\sin\alpha - T_{DB}\sin\alpha = 0$ **(3)** (1 Pt)

$\sum MF_X = +F\times AC - T_{EB}\cos\alpha\cos\beta\times AB - T_{DB}\cos\alpha\cos\beta\times AB = 0$ **(4)** (1 Pt)

$\sum MF_Y = -T_{EB}\cos\alpha\sin\beta\times AB + T_{DB}\cos\alpha\cos\beta\times AB = 0$ **(5)** (1 Pt)

$\sum MF_Z = 0$ **(6)** (1 Pt)

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Exercice 03 : (05 Pts)

$V_x = \frac{dx}{dt} = 4 \qquad V_y = \frac{dy}{dt} = 4t \qquad ==> \quad V = \sqrt{V_x^2 + V_y^2} = 4\sqrt{1+t^2}$ **(0,5 Pt)**

Projections de l'accélération sur x et y

$a_x = \frac{dV_x}{dt} = 0 \quad a_y = \frac{dV_y}{dt} = 4 \quad ==> a = a_y = 4\left(\frac{m}{s^2}\right)$ **(0,5 Pt)**

$a_\tau = \frac{dV}{dt} = \frac{4.2t}{2\sqrt{1+t^2}} = \frac{4t}{\sqrt{1+t^2}}$ **(1 Pt)**

$a_n = a^2 - a_\tau^2 = \sqrt{16 - \frac{16t^2}{1+t^2}} = \frac{4}{\sqrt{1+t^2}}$ **(1 Pt)**

$\rho = \frac{V^2}{a_n} = \frac{16(1+t^2)\sqrt{1+t^2}}{4} = 4(1+t^2)^{3/2}$ **(1 Pt)**

Pour $t = 1s$ on a $\rho = 4(1+1^2)^{3/2} = 4.2\sqrt{2} = 11,4\ (m)$ **(1 Pt)**