Corrigé type du module Mécanique Analytique

Licence 3- S5- Option : Construction Mécanique- 2016/2017

Exercice N°1

$\sum W(\vec{f}) = \Delta E_c$……0.5p

$W(\vec{p}) = \frac{1}{2}I\dot{\theta}^2 + \frac{1}{2}m\dot{x}^2 = \frac{1}{2}mR^2\dot{\theta}^2 + \frac{1}{2}m\dot{x}^2 = m\dot{x}^2$……..0.5p

$mgH_A = m\dot{x}^2$……..0.5p

$\dot{x} = V_B = \sqrt{gH_A}$……..0.5p

$\dot{x} = V_B = 2.23\, m/s$……..0.5p

L'axe lié au point O

x(O)=0 ; y(O)=0……..0.5

x(K)=$Rsin(V/Rt+\varphi)$; y(K)= $Rcos(V/Rt+\varphi)$ ……..1p

L'axe lié au point O

x(O)=Vt ; y(O)=0……..0.5p

x(K)= $Vt + Rsin(V/Rt+\varphi)$; y(K)= $Rcos(V/Rt+\varphi)$ ……..1p

Exercice N°2

$I_{xx}=\rho\iint(y^2)ds = \rho\int_{-\frac{b}{2}}^{\frac{b}{2}} y^2dy\int_{-\frac{a}{2}}^{\frac{a}{2}} dx = \rho\frac{b^3}{12}a$……1.5p

$I_{xx}=\frac{1}{12}mb^2$……1p

$I_{yy}=\frac{1}{12}ma^2$……...2p

$I_{zz}=\frac{1}{12}m(a^2+b^2)$……2p

$$I_0 = \begin{vmatrix} \frac{1}{12}mb^2 & 0 & 0 \\ 0 & Iyy = \frac{1}{12}ma^2 & 0 \\ 0 & 0 & \frac{1}{12}m(a^2+b^2) \end{vmatrix}$$ ……1

Exercice N°3

$H=T+U$ ……...0.5p

$T=\frac{1}{2}m\dot{x}^2$……1p

$U=\frac{1}{2}k_1x^2 + \frac{1}{2}k_2x^2=\frac{1}{2}(k_1+k_2)x^2$……..1p

$H=\frac{1}{2}m\dot{x}^2 + \frac{1}{2}(k_1+k_2)x^2$……...0.5p

$\frac{dH}{dt} = m\dot{x}\ddot{x} + (k_1+k_2)x\dot{x} = 0$……...2p

$\Rightarrow m\ddot{x} + (k_1+k_2)x = 0 \Rightarrow \ddot{x} + \frac{(k_1+k_2)}{m}x = 0$ Équation différentielle de second ordre…2p