juin 2013

1) See previous exams' corrections

2)

21) $\frac{dE}{dt} = \mathcal{P}_{\text{non conservative}} = \frac{d}{dt}\left(E_c + E_p\right)$

$E_p = \frac{g}{2} g \sin\varphi \qquad \frac{dE_p}{dt} = \frac{g}{2} g \cos\varphi \cdot \dot{\varphi}$

$E_c = 2\dot{\varphi}^2 \qquad \frac{dE_c}{dt} = 4\dot{\varphi}\ddot{\varphi}$

$\mathcal{M}_\Delta = -c\dot{\varphi} \qquad \mathcal{P}(\mathcal{M}_\Delta) = -c\dot{\varphi}\dot{\varphi} = -c\dot{\varphi}^2$

$$\frac{g}{2} g \dot{\varphi}\cos\varphi + 4\dot{\varphi}\ddot{\varphi} + c\dot{\varphi}^2 = 0$$

$$\boxed{4\ddot{\varphi} + c\dot{\varphi} + \frac{g}{2} g \cos\varphi = 0}$$

Equilibre : $\ddot{\varphi} = 0 \quad \dot{\varphi} = 0 \quad : \quad \frac{g}{2} g \cos\varphi = 0 \Rightarrow \boxed{\varphi = \pm\frac{\pi}{2}}$

22) l'équation est de la forme $\ddot{\varphi} + 2\xi\omega_0\dot{\varphi} + \omega_0^2 \cos\varphi = 0$

avec $2\xi\omega_0 = \frac{c}{4} \rightarrow \boxed{\xi = \frac{c}{8\omega_0}}$

$\omega_0 > 0$ et $c = 2\ N.m.s.rd^{-1} \rightarrow \xi < 1$

$\rightarrow$ régime pseudo-périodique.

3) See previous exercises' corrections.