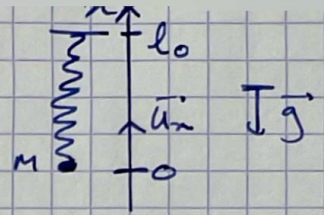


Exercice 3



1) On étudie la position de la masse, M , un système conservatif.

$$\begin{cases} E_c = \frac{1}{2} m \dot{x}^2 \\ E_{p, \text{pes}} = x mg \\ E_{p, \text{rap}} = \frac{1}{2} k x^2 \end{cases}$$

Par le TEM, $\frac{dE_m}{dt} = 0$

$$\text{d'où } m\ddot{x} + x mg + kx = 0$$

$$\Leftrightarrow \ddot{x} + \frac{k}{m}x = -g$$

$$\text{On pose } \omega_1 = \sqrt{\frac{k}{m}}$$

$$\text{Ainsi } T_1 = \frac{2\pi}{\omega_1} = 2\pi \sqrt{\frac{m}{k}}$$

2) Désormais, masse plongée dans un fluide: on ajoute $\vec{F} = -6\pi\eta R \dot{x} \vec{u}_x$

PFD: $m\ddot{x} = -kx - 6\pi\eta R \dot{x} - mg$ d'où $\ddot{x} + \frac{6\pi\eta R}{m} \dot{x} + \frac{k}{m}x = -g$

$$\text{On pose } \begin{cases} T_2 = \frac{2\pi}{\omega_2} \\ \frac{\omega_1}{Q} = 6\pi\eta \frac{R}{m} \end{cases}$$

On la pseudo pulsation (existe car $Q > \frac{1}{2}$) vaut:

$$\omega_2 = \omega_1 \sqrt{1 - \frac{1}{4Q^2}} \Leftrightarrow Q = \frac{1}{2} \frac{1}{\sqrt{1 - (\frac{T_1}{T_2})^2}}$$

$$\Rightarrow \eta = \frac{m}{R 6\pi} \times \frac{2\pi}{T_1} \times 2 \sqrt{1 - (\frac{T_1}{T_2})^2}$$

AN: $\eta = 3,73 \cdot 10^{-1} \text{ kg m}^{-1} \text{ s}^{-1}$

$$\text{et } [\eta] = \frac{[F]}{[R][\dot{x}]} = \frac{M \cdot L \cdot T^{-2}}{L \cdot L \cdot T^{-1}} = M \cdot L^{-1} \cdot T^{-1}$$

