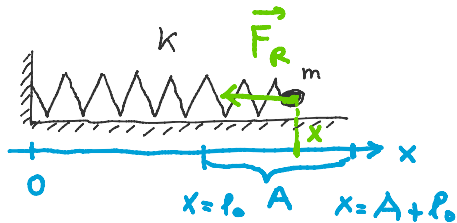


Oscillations harmoniques: système masse-ressort et circuit L-C les équations

jeudi, 31 décembre 2020 15:21



$$\vec{F}_R = -k(\vec{x} - \vec{l}_0)$$

$$\sum \vec{F} = \vec{F}_R = -k(\vec{x} - \vec{l}_0) = m\vec{a}_x$$

2^{ème} dérivée
↓ par rapport

sur x: $-k(x - l_0) = m a_x = m \ddot{x}$ à t

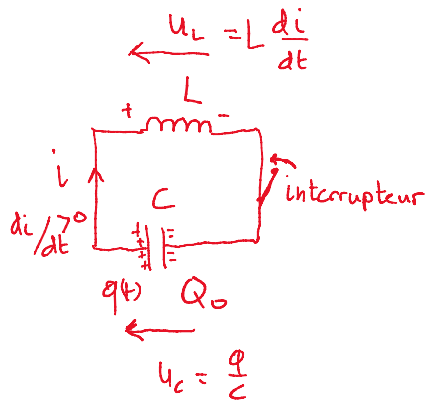
$$\Rightarrow \ddot{x} = -\frac{k}{m}(x - l_0)$$

chgt de variable: $\begin{cases} z = x - l_0 \\ \dot{z} = \dot{x} \\ \ddot{z} = \ddot{x} \end{cases}$

$$\ddot{z} = -\frac{k}{m}z$$

Conditions initiales:
 $t = 0$

$$\begin{cases} z(0) = x(0) - l_0 = A \\ \dot{z}(0) = 0 \end{cases}$$



Kirchhoff: $u_L + u_C = 0$

$$L \frac{di}{dt} + \frac{q}{c} = 0 \Rightarrow L \ddot{q} + \frac{q}{c} = 0 \Rightarrow$$

$$\ddot{q} = -\frac{1}{LC}q$$

Conditions initiales:
 $t = 0$

$$\begin{cases} q(0) = Q_0 \\ \dot{q}(0) = 0 \end{cases}$$

$$\left\{ \begin{array}{l} \frac{di}{dt} \rightarrow i \\ i = \frac{dq}{dt} = \dot{q} \\ i = \dot{q} \end{array} \right\}$$