Corrigé du Pb – CC1 du 28 octobre 2005

Partie I :

1.1 – $E = u_R + u_L = Ri + L\frac{di}{dt} \rightarrow \boxed{\frac{di}{dt} + \frac{R}{L} i = \frac{E}{L}}$ donc $\tau = \frac{L}{R}$ et $a = \frac{E}{L}$

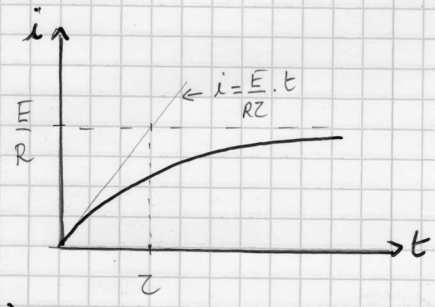
1.2 – $\frac{di}{dt} + \frac{1}{\tau} i = a \rightarrow [\tau] = [dt] = [T]$ et $[a] = \left[\frac{i}{\tau}\right] = \frac{[I]}{[T]}$

1.3 – AN : $\tau = \frac{25.10^{-3}}{10^3} = 25\ \mu s$

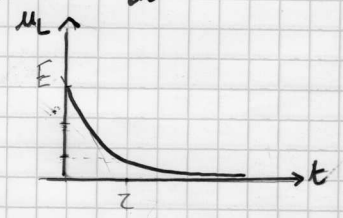
2.1 – $i(t) = A \exp(-t/\tau) + \frac{E}{R}$ (sol. de l'éq. homog. + sol. particulière)

$i(t=0) = A + \frac{E}{R} = 0 \rightarrow \boxed{i(t) = \frac{E}{R}\left(1 - \exp(-t/\tau)\right)}$

2.2 – Graphe $i(t)$



3 – $u_L(t) = L\frac{di}{dt} = E e^{-t/\tau}$



Partie II :

1.1 – $E = U_R + U_L + u_C = Ri + L\frac{di}{dt} + \frac{1}{C} q = R\frac{dq}{dt} + L\frac{d^2q}{dt^2} + \frac{1}{C} q$

$\rightarrow \frac{d^2q}{dt^2} + \frac{R}{L}\frac{dq}{dt} + \frac{1}{LC} q = \frac{E}{L}$

on dérive et on remplace $q \rightarrow i$ en utilisant $i = \frac{dq}{dt}$

$$\boxed{\frac{d^2i}{dt^2} + \frac{R}{L}\frac{di}{dt} + \frac{1}{LC} i = 0}$$

$\tau = \frac{L}{R}$ et $\omega_0 = \frac{1}{\sqrt{LC}}$

1.2 – $[\omega_0]^2 = [T]^{-2}$ donc $[\omega_0] = [T]^{-1}$

1.3 – $\tau = 25\ \mu s$, $\omega_0 = 6{,}3.10^4\ rds^{-1}$, $f_0 = \frac{\omega_0}{2\pi} \simeq 10^4\ Hz$, $T_0 = \frac{1}{f_0} = 100\ \mu s$

$Q = \omega_0 \tau \simeq 1{,}58$

1.4 – Régime pseudo-périodique. Allure $i(t)$.