Dipôles RC, RL, RLC

Chapitre 5, 6, 7

	Dipôle RC	Dipôle RL	Dipôle RLC
Formules	$\boxed{q = C \times u_C}$ $\boxed{i = C\frac{du_C}{dt}}$	Bobine idéale $\boxed{u_L = L\frac{di}{dt}}$ Bobine réelle $\boxed{u_L = L\frac{di}{dt} + ri}$	
Eq Diff	$\boxed{E = RC\frac{du_C}{dt} + \mathrm{u_C}} \Rightarrow u_C(t) = A + Be^{-\frac{t}{\tau}}$	$\boxed{E = L\frac{di}{dt} + R_{eq}i} \Rightarrow i(t) = A + Be^{-\frac{t}{\tau}}$	$\boxed{\ddot{u}_C + \frac{1}{LC}u_C = 0} \Rightarrow u_C(t) = u_0\cos\left(\frac{2\pi}{T_0}t + \phi_0\right)$
Charge	$A = E, B = -E, \boxed{\tau = RC}$ $\boxed{u_C(t) = E\left(1 - e^{-\frac{t}{\tau}}\right)}$	$\mathrm{A} = \mathrm{I_0}, \mathrm{B} = -\mathrm{I_0}, \boxed{\tau = \frac{L}{R_{eq}}}, \boxed{I_0 = \frac{E}{R_{eq}}}$ $\boxed{i(t) = \mathrm{I_0}\left(1 - e^{-\frac{t}{\tau}}\right)}$	$u_0 = E,\ \phi_0 = 0, \boxed{T_0 = 2\pi\sqrt{LC}}$ $\boxed{u_C(t) = E\cos\left(\frac{2\pi}{T_0}t\right)}$
Décharge	$A = 0, B = E, \tau = RC$ $\boxed{u_C(t) = Ee^{-\frac{t}{\tau}}}$ et $i(t) < 0$	$\mathrm{A} = 0, \mathrm{B} = \mathrm{I_0},\ \tau = \frac{L}{R_{eq}},\ I_0 = \frac{E}{R_{eq}}$ $\boxed{i(t) = \mathrm{I_0}e^{-\frac{t}{\tau}}}$	Circuit RLC : $\boxed{\ddot{u}_C + \frac{r+R}{L}\dot{u}_C + \frac{1}{LC}u_C = 0}$
On peut utiliser	$i(t) = C\frac{du_C}{dt}$ $u_R(t) = Ri$	$u_R(t) = Ri$ $u_L(t) = E - u_R$	$u_C = \frac{q}{C} \Rightarrow \ddot{q} + \frac{1}{LC}q = 0$ $q(t) = Cu_C(t)$ $i(t) = \frac{dq}{dt} = C\frac{du_C}{dt}$
Énergies	$\boxed{\mathcal{E}_C = \frac{1}{2}\mathrm{Cu^2}}$	$\boxed{\mathcal{E}_\mathrm{L} = \frac{1}{2}\mathrm{Li^2}}$	$\boxed{\mathcal{E}_T = \frac{1}{2}\mathrm{CE^2}}$

Vérification de la dimension de τ ou T_0

$$[R] : u = Ri \Rightarrow R = \frac{u}{i} \Rightarrow \boxed{[R] = V.A^{-1}}$$

$$[L] : u_L = L\frac{\Delta \mathrm{i}}{\Delta t} \Rightarrow L = u_L\frac{\Delta \mathrm{t}}{\Delta \mathrm{i}} \Rightarrow \boxed{[L] = V.s.A^{-1}}$$

$$[C] : q = Cu_C \text{ et } i = \frac{\Delta q}{\Delta t} \Rightarrow C = \frac{q}{u_C} et\ q = i\Delta \mathrm{t} \Rightarrow C = \frac{i\Delta \mathrm{t}}{\mathrm{u_C}} \Rightarrow \boxed{[C] = A.s.V^{-1}}$$