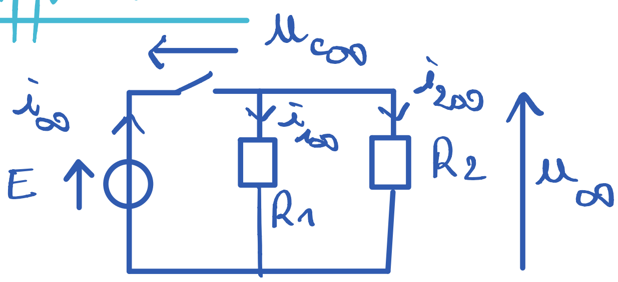
Chapitre 5

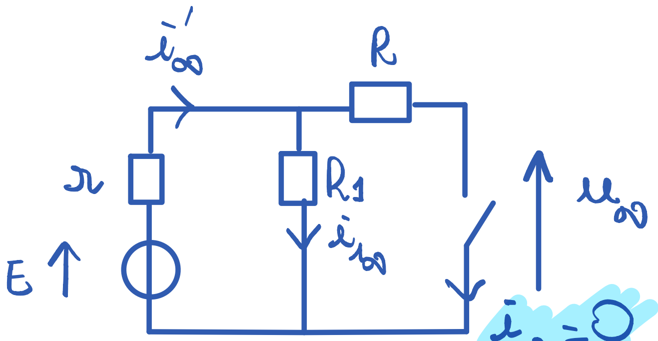
Application 1



$i_\infty = 0$ car ⟋

↳ $i_{1\infty} = i_{2\infty} = 0$

loi des mailles : $E = u_{C\infty} + u_\infty \Rightarrow u_{C\infty} = E$



$i_\infty = 0$

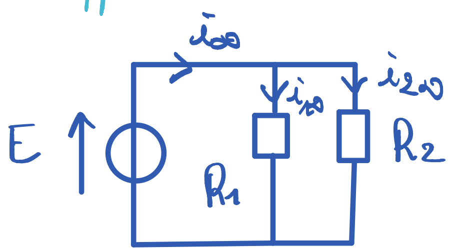
$i_\infty = 0 \Rightarrow i'_\infty = i_{1\infty}$

loi des mailles : $E = r i'_\infty + R_1 i_{1\infty}$

$$i'_\infty = i_{1\infty} = \frac{E}{r + R_1}$$

tension aux bornes de R $= 0 \Rightarrow u_\infty = R_1 i_{1\infty} = R_1 \dfrac{E}{r+R_1}$

Application 2



$R_1 // R_2$: $R_{eq} = \dfrac{R_1 R_2}{R_1 + R_2}$ $\qquad i_\infty = \dfrac{E}{R_{eq}}$

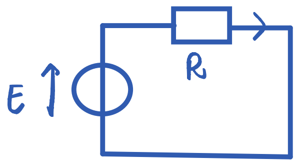
$$i_{1\infty} = i_\infty \frac{R_2}{R_1 + R_2}$$

$$i_{2\infty} = i_\infty \frac{R_1}{R_1 + R_2}$$

(ponts diviseurs de courant)

II.2. Retour à l'établissement de courant

*** Régime permanent :**



$i_\infty = \frac{E}{R}$ (loi des mailles)

$u_\infty = 0$ (fil)

le courant finit par s'établir

*** Régime transitoire :**

loi des mailles : $E = u + Ri$ or $u = L\frac{di}{dt}$ $\rightarrow$ $L\frac{di}{dt} + Ri = E$

Forme canonique : $\boxed{\frac{di}{dt} + \frac{R}{L} i = \frac{E}{L}}$ on identifie $\tau = \frac{L}{R}$

solution : $i(t) = A\exp\left(-\frac{t}{\tau}\right) + \frac{E}{R}$ $A \in \mathbb{R}$

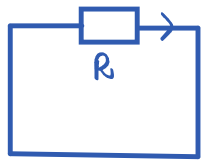
solution particulière $= i_\infty$

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

expression de $u(t)$: $u = L\frac{di}{dt}$ ou $u = E - Ri$ ... $\boxed{u(t) = E\exp\left(-\frac{t}{\tau}\right)}$

II.3. Régime libre

*** Régime permanent :**



$i_\infty = 0$

$u_\infty = 0$ (fil)

le courant finit par s'annuler

*** Régime transitoire :**

loi des mailles : $0 = u + Ri$ or $u = L\frac{di}{dt}$ $\rightarrow$ $L\frac{di}{dt} + Ri = 0$

Forme canonique : $\boxed{\frac{di}{dt} + \frac{R}{L} i = 0}$ on identifie $\tau = \frac{L}{R}$

solution : $i(t) = A\exp\left(-\frac{t}{\tau}\right)$ $A \in \mathbb{R}$ (pas de solution particulière : $i_\infty = 0$)

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

expression de $u(t)$: $u = L\frac{di}{dt}$ ou $u = -Ri$ ... $\boxed{u(t) = -E\exp\left(-\frac{t}{\tau}\right)}$