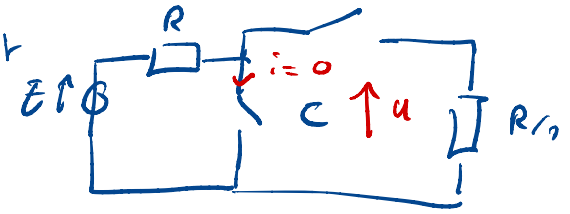
Exercice 5

1 • La tension est continue aux bornes du condensateur.

donc u est continue. $u(t=0^-) = u(t=0^+)$

• déterminons $u(t=0^-)$. Loi mailles à gauche.

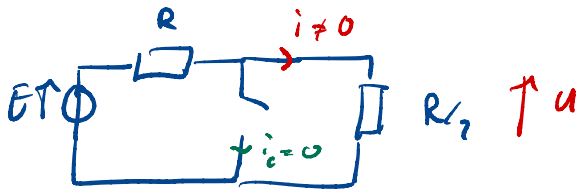
Circuit équivalent



$E = R\underbrace{i}_{0} + u(0^-)$ $\quad \boxed{u(t=0^-) = E}$

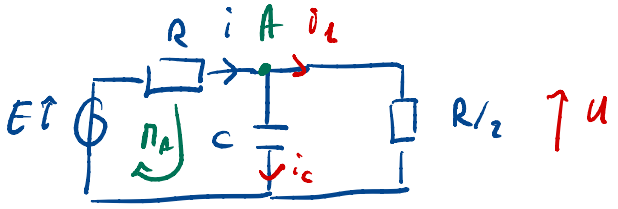
• donc $\boxed{u(0^+) = u(0^-) = E}$

2 • Schéma équivalent en $t \to +\infty$



PDT $\quad u = \dfrac{R/2}{R + R/2} E \iff \boxed{u = \dfrac{E}{3}}$

3



LΠ sur Π_A : $\quad E = Ri + u$

LN en A : $\quad i = i_1 + i_C \Rightarrow E = R(i_2 + i_C) + u$

Lois de comportement $\quad \left.\begin{aligned} u &= \tfrac{R}{2} i_2 \\ i_C &= C\dfrac{du}{dt} \end{aligned}\right\} \Rightarrow E = R\left(\dfrac{2}{R}u + C\dfrac{du}{dt}\right) + u$

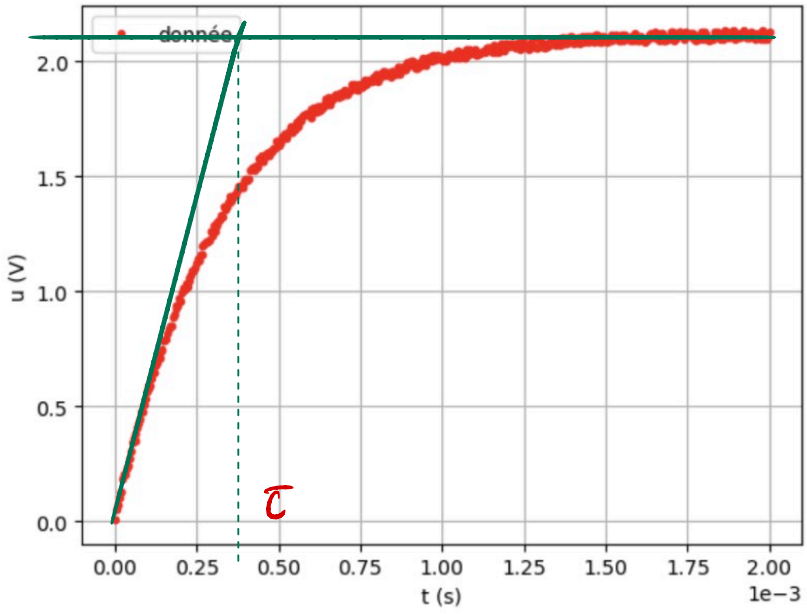
d'où $E = 3u + RC\frac{du}{dt}$

$\Leftrightarrow \frac{du}{dt} + \frac{3}{RC}u = \frac{E}{RC}$

posons $\boxed{\tau = \frac{RC}{3}}$

$\Leftrightarrow \boxed{\frac{du}{dt} + \frac{u}{\tau} = \frac{E}{3\tau}}$

4



1,6 cm ↔ ?
4,3 cm ↔ 1,00 ms
⇒ $\tau \simeq 0{,}37$ ms

OR $\tau = \frac{RC}{3}$ d'où $\boxed{C = \frac{3\tau}{R}}$

A.N. $C = \frac{3 \times 0{,}37 \times 10^{-3}}{10 \times 10^{3}} 10^{-7} \simeq 100 \times 10^{-9}$