

TD SE2 exo 1

Equation de maille ① $E = \overbrace{L \frac{di_L}{dt}}^{u_L} + Ri$

$$= L \frac{di_L}{dt} + R(i_L + i_R)$$

$$u_L = Ri_R = L \frac{di_L}{dt} \Rightarrow i_R = \frac{L}{R} \frac{di_L}{dt}$$

$$E = L \frac{di_L}{dt} + Ri_L + \cancel{R} \times \frac{L}{\cancel{R}} \frac{di_L}{dt} \Rightarrow \textcircled{2L} \frac{di_L}{dt} + Ri_L = E$$

$$\Rightarrow \frac{di_L}{dt} + \frac{R}{2L} i_L = \frac{E}{2L}$$

$$\frac{di_L}{dt} + \frac{R}{2L} i_L = 0$$

$$i_L = A \exp\left(-\frac{R}{2L} t\right)$$

$$\underbrace{\frac{di_L}{dt}}_{=0} + \frac{R}{2L} i_L = \frac{E}{2L} \Rightarrow i_L = \frac{E}{R}$$

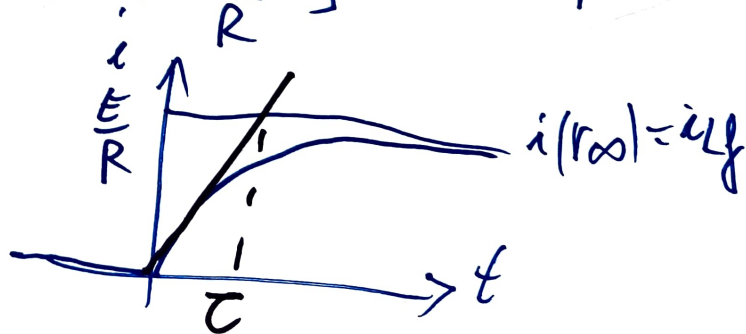
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$$i_L(t) = A \exp\left(-\frac{t}{\tau}\right) + \frac{E}{R} \quad \text{ou } \tau = \frac{2L}{R}$$

$$\mathcal{L}_L = \frac{1}{2} L i^2 \text{ est continue} \Rightarrow i(0^-) = i(0^+)$$

$$\left. \begin{array}{l} \text{K ouvert depuis longtemps } i(0^-) = 0 \\ i(0^+) = A + \frac{E}{R} \end{array} \right\} \Rightarrow A = -\frac{E}{R}$$

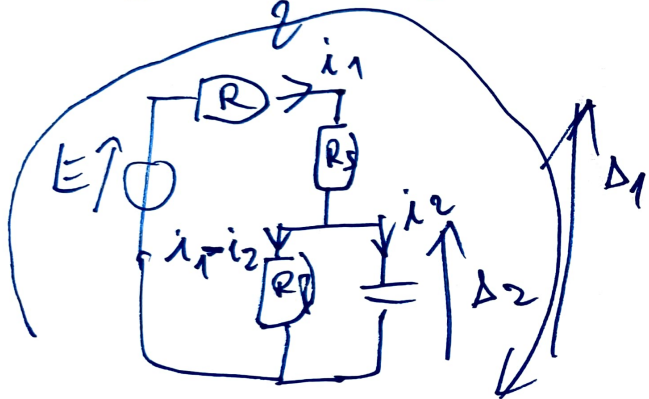
$$i_L(t) = \frac{E}{R} \left[1 - \exp\left(-\frac{t}{\tau}\right) \right]$$



Exo 2

1) à $t=0^+$ $\Delta_2(0^+) = 0$ (C décharge)

$\mathcal{L}_C = \frac{1}{s} C u_C^2$ est continue $\Rightarrow \Delta_2(0^+) = \Delta_2(0^-) = 0$



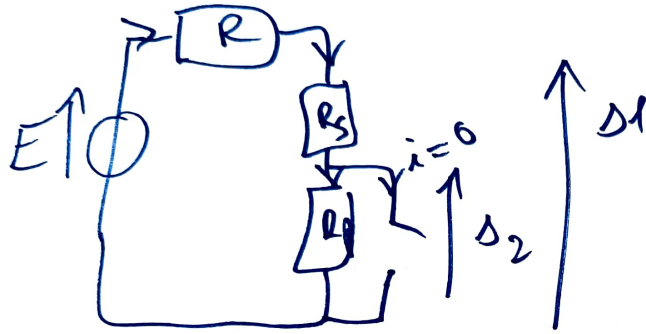
$$\Delta_1 = R_s i_1 + \Delta_2$$

$$E = (R + R_s) i_1 + \Delta_2$$

$$\frac{\Delta_1(0^+)}{E} = \frac{R_s}{R + R_s} \Big|_{\text{PDT}} \text{ car } \Delta_2(0^+) = 0$$

$$\Rightarrow \Delta_1(0^+) = \frac{R}{R + R_s} E$$

A l'∞ Régime permanent continu: $C \approx$ int ouu 4/



PDT

$$\Delta_2 = R_p i_1$$

$$E = (R + R_s + R_p) i_1$$

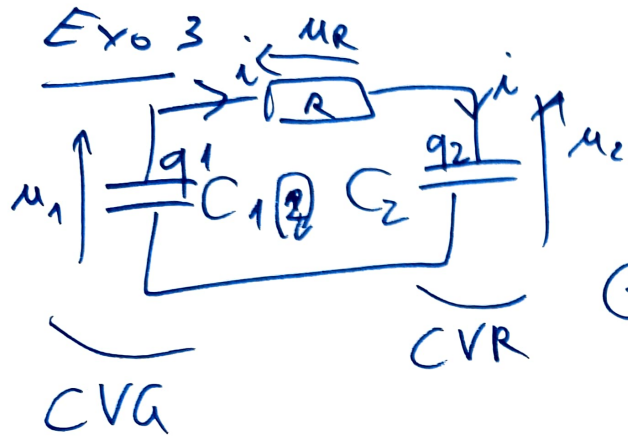
$$\Delta_2(\infty) = \frac{R_p}{R + R_s + R_p} E$$

$$\Delta_1 = (R_s + R_p) i_1$$

$$\Delta_1(\infty) = \frac{R_s + R_p}{R + R_s + R_p} E$$

2) méthode ① $E = (R + R_s) i_1 + \Delta_2$ ou $\Delta_2 = R_p (i_1 - i_2)$

$$\Rightarrow i_1 = \frac{\Delta_2}{R_p} + i_2 = \frac{\Delta_2}{R_p} + C \frac{d\Delta_2}{dt} \quad \text{②} \Rightarrow \text{do ①}$$



$$\textcircled{2} \quad u_1 - Ri - u_2 = 0$$

$$\textcircled{1} \quad i = C_2 \frac{du_2}{dt} = \uparrow C_1 \frac{du_1}{dt}$$

can C_1 est en CVG

On dérive $\textcircled{2}$

$$\frac{du_1}{dt} - R \frac{di}{dt} - \frac{du_2}{dt} = 0$$

$$\textcircled{1} \Rightarrow -\frac{i}{C_1} - R \frac{di}{dt} - \frac{i}{C_2} = 0$$

$$\Rightarrow \frac{di}{dt} + \frac{1}{R} \left(\frac{1}{C_1} + \frac{1}{C_2} \right) i = 0$$