Exercice 6

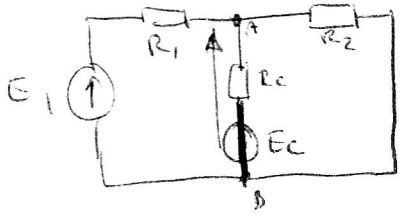
1] $E_c = 82 \times 2{,}35 = 192{,}7\ V$

$R_c = 82 \times r = 751{,}12\ \mu\Omega = 0{,}751\ m\Omega$

2] $U_{AB} = E_c + R_c I_c = 192{,}7 + 0{,}751.10^{-3} \times 120.10^{3} = 282{,}83\ V$

3] a) U_{AB} par le théorème de superposition

1ère étape : $E_2 = 0$ $E_c = 0$



$$U_{AB} = \frac{R_2 // R_c}{(R_2 // R_c) + R_1} \times E_1$$

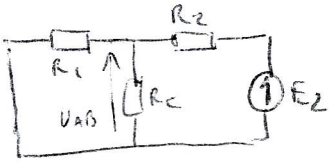
$$= \frac{R_2 \times R_c}{R_2 + R_c} \times E_1 \times \frac{1}{R_1 + \frac{R_2 R_c}{R_2 + R_c}}$$

$$= \frac{R_2 R_c \cdot E_1}{R_1(R_2 + R_c) + R_2 R_c}$$

$$= \frac{R_2 R_c}{R_1 R_2 + R_1 R_c + R_2 R_c} E_1$$

2ème étape : $E_1 = 0$ $E_c = 0$

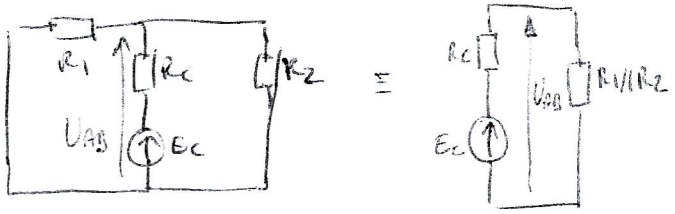
idem puisque $R_1 = R_2$



$$U_{AB} = \frac{(R_1 // R_c) E_2}{(R_1 // R_c) + R_2}$$

$$= \frac{R_1 R_c}{R_1 R_2 + R_2 R_c + R_1 R_c} E_2$$

3ème étape : $E_1 = 0$ $E_2 = 0$



$$U_{AB} = \frac{(R_1 // R_2) \times E_c}{(R_1 // R_2) + R_c}$$

$$= \frac{R_1 R_2}{R_1 R_c + R_2 R_c + R_1 R_2} E_c$$

$$\rightarrow \quad U_{AB} = \frac{R_2 R_c E_1 + R_1 R_c E_2 + R_1 R_2 E_c}{R_1 R_c + R_2 R_c + R_1 R_2}$$

b) Millman : $U_{AB} = \dfrac{\frac{E_1}{R_1} + \frac{E_2}{R_2} + \frac{E_c}{R_c}}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_c}} = \dfrac{R_2 R_c E_1 + R_1 R_c E_2 + R_1 R_2 E_c}{R_2 R_c + R_1 R_c + R_1 R_2}$

4) $E_1 = R_1 I_1 + U_{AB}$

$\rightarrow I_1 = \dfrac{E_1 - U_{AB}}{R_1}$

et $I_2 = \dfrac{E_2 - U_{AB}}{R_2}$

5) $\left.\begin{matrix} E_1 = E_2 \\ R_1 = R_2 \end{matrix}\right\} \rightarrow I_1 = I_2 = \dfrac{I_c}{2} = 60 \text{ kA}$

et donc $E_1 = E_2 = R_1 I_1 + U_{AB}$

$= R_1 I_1 + R_c I_c + E_c$

$= 319,72 \text{ V}$.