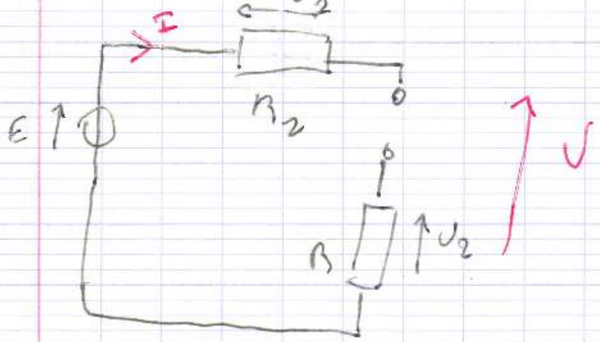
K ouvert ($I_K = 0$)

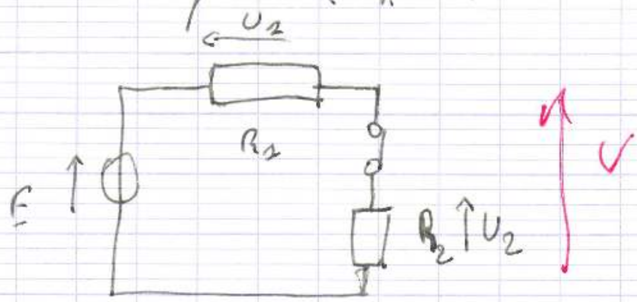


$I = 0\,A$

$U_1 = U_2 = 0$

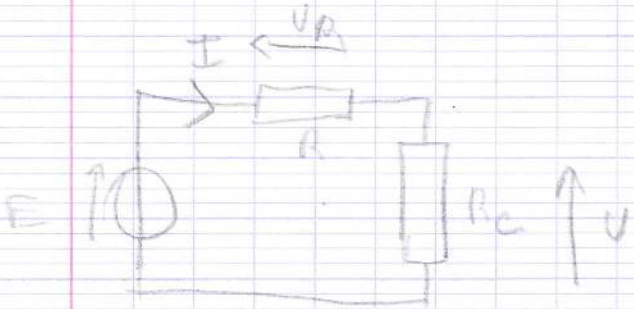
$V = E$

K fermé ($V_K = 0$)



$$V = U_2 = \frac{E \times R_2}{R_1 + R_2}$$

$$U_1 = \frac{E \times R_1}{R_1 + R_2}$$



$U_R = R \times I$

$U = R_c \times I \Leftrightarrow I = \frac{U}{R_c}$

$E - U_R - U = 0$

$E - R \times I - R_c \times I = 0$

$I = \frac{U}{R_c} = \frac{20}{32} =$

$$U = \frac{E \times R_c}{R + R_c}$$

$V_E = U + U_R \Leftrightarrow R \times V_R + U \times R_c$

$V_E = (R + R_c) I \Rightarrow I = \frac{V_E}{R + R_c}$

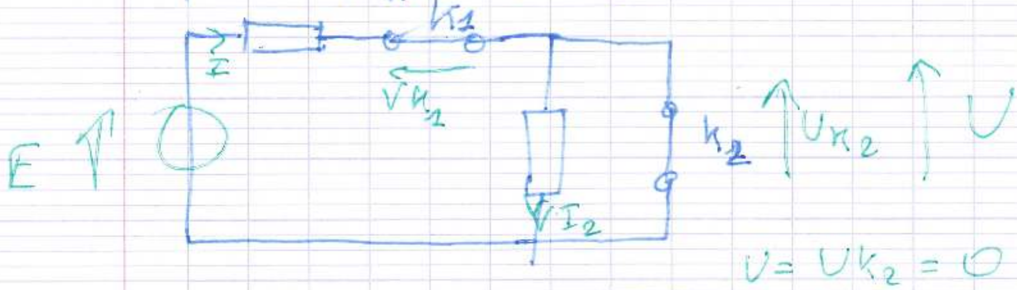
By Hyperion

K ouvert

$U_1 = U_2 = 0$ $U = E$

K1 fermé : ($V_{K1} = 0$) I_{K1} ?

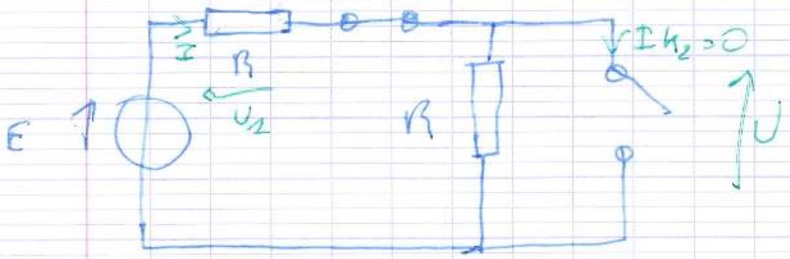
K2 fermé : ($V_{K2} = 0$) I_{K2} ?



$U = U_{K_2} = 0$

K1 fermé : ($U_{K1} = 0$) I_{K1} ?

K2 ~~fermé~~ ouvert ($I_{K2} = 0$) U_{K2} ?



$U_1 = R \times I$

$U = E - R I$

$I = \frac{U}{R}$

$U = \frac{1}{2} E$

$U = \frac{E \times R}{R + R} = \frac{E}{2}$

By Hyperion

$$\frac{1}{4R} + \frac{1}{4R} = \frac{2}{4R} = \frac{1}{2R} = 2R + 2R = 4R \Rightarrow 2R + R = 3R$$

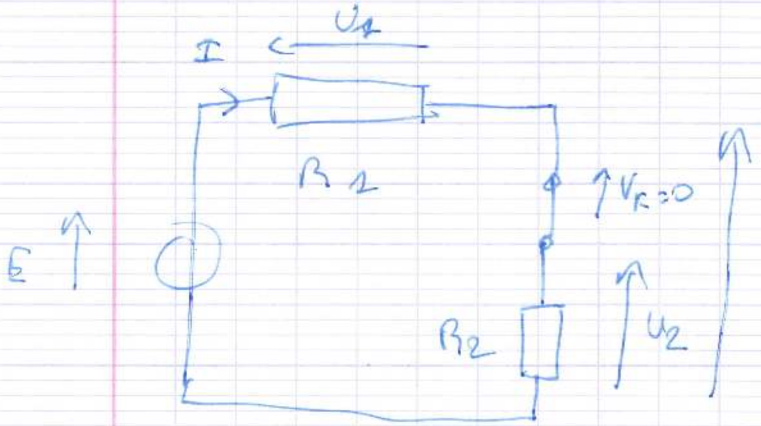
$$\frac{1}{6R} + \frac{1}{\cancel{R}} = \frac{1}{10R} \Leftrightarrow 10R + R = 11R$$

$$\frac{1}{2R} + \frac{1}{2R} = R + R = \frac{1}{2R} + \frac{1}{2R} = R$$

$$\frac{1}{3R} + \frac{1}{2R} = 5R + R = \frac{1}{6R} + \frac{6}{6R} = \frac{7}{6R} = \frac{6R}{7}$$

$$\frac{1}{4R} + \frac{1}{4R} = 2R + 4R = \frac{1}{6R} + \frac{3}{3R} = \frac{4}{6R} + \frac{3}{6R} = 2R$$

$$\frac{1}{2R} + \frac{1}{2R} = R + 2R = \frac{1}{3R} + \frac{1}{3R} = \frac{2}{3R} = \frac{3R}{2} + \frac{4R}{2} = \frac{7R}{2}$$



$E - U_1 - U_2 = 0$

$V = U_2 + V_k$

$R_1 = \frac{U_1}{I}$

$R_2 = \frac{U_2}{I}$

$\boxed{E - U_1 - U_2 = 0}$

$E - U_1 - V = 0$ car $U_k = 0$

$E - 3R_2 - R_2 = 0$

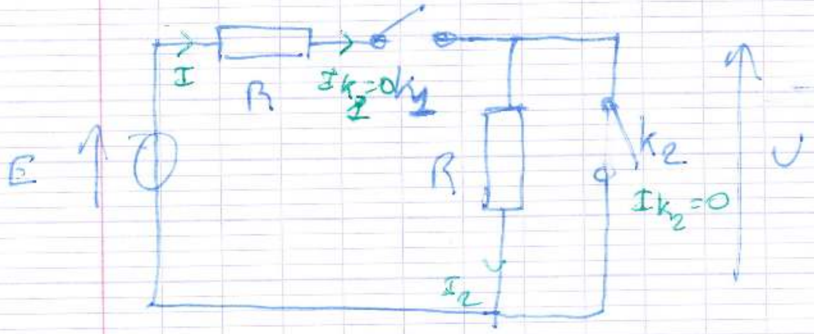
$E - 4R_2$

By Hyperion

$$V = U_2 = \frac{E \times R_2}{R_1 + R_2}$$

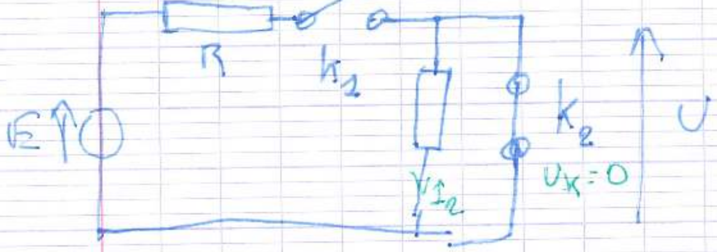
$$V_2 = E \times \frac{R_2}{R_2 + 3R_2} = E \times \frac{R_2}{4R_2} = \frac{E}{4} = \frac{10}{\cancel{3}4} = 2{,}5\,V$$

k_1 ouvert ($I_{k_1} = 0$) V_{k1} ?
k_2 ouvert ($I_{k_2} = 0$) V_{k2} ?



$I_2 = 0$
$U = R \cdot I_2 = 0$

k_1 ouvert ($I_{k_1} = 0$) V_{k_1} ?
k_2 fermé ($V_{k2} = 0$) I_{k_2} ?



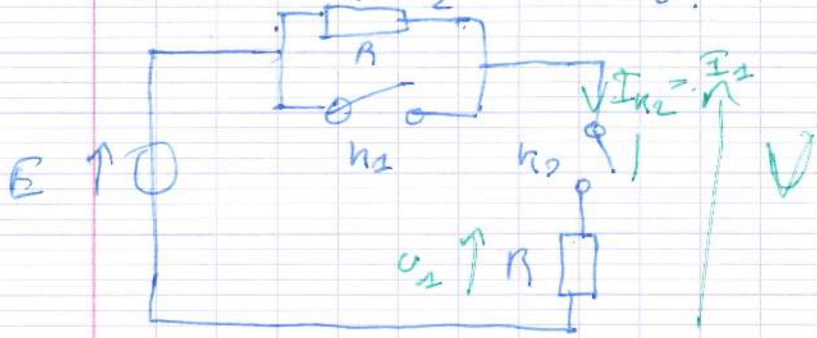
$I_2 = 0$
$U_? = R \cdot I_2 = 0$

$U = U_{k_2} = 0$

By Hyperion

Electro
4/10

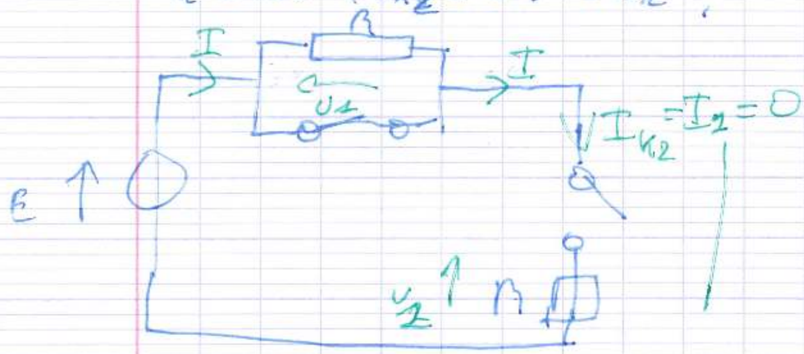
K_1 ouvert $(I_{K_1} = 0)$ U_{K_1} ?
K_2 ouvert $(I_{K_2} = 0)$ U_{K_2} ?



$I_1 = 0$

$U_1 = R \cdot I_1 = 0$

k_1 fermé $(U_{k_1} = 0)$ I_{k_1} ?
K_2 ouvert $(I_{k_2} = 0)$ U_{k_2} ?



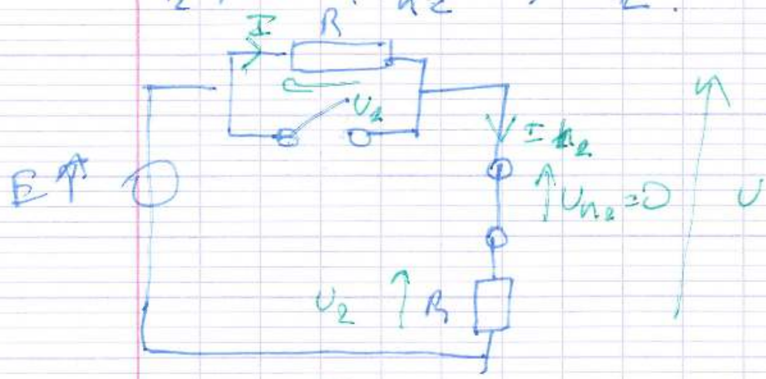
$I_{k_2} = 0 = I$

$U_1 = R \cdot I_{k_2} = 0$

$E - U_1 - U = 0$

$E = U$

K_1 ouvert $(I_{K_1} = 0)$ U_{k_1} ?
K_2 fermé $(U_{K_2} = 0)$ I_{k_2} ?

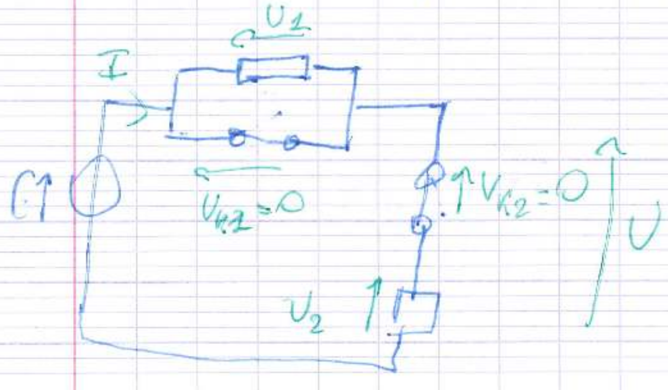


$U = U_2$

$E - U_1 - U_2 = 0$

$U_1 = R \cdot I$

$U_2 = R \cdot I_{k_2}$



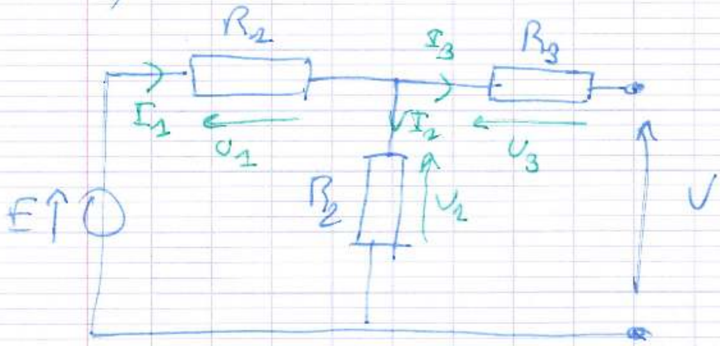
$U_1 = 0$

$U = U_2$

$E - U_1 - U = 0$

$E = U$

7)



$E - U_1 - U_3 - U = 0$

$E - U_1 - U_2 = 0$

$U_1 =$

$\cancel{E} - \cancel{U_1} - U_3 - U = \cancel{E} - \cancel{U_1} - U_2$

$U + U_3 - U_2 = 0$

$U_1 = R_1 . I_1$

$U_2 = R_2 . I_2$

$U_3 = R_3 . I_3$

$I_1 = I_2 + I_3$

Or

$I_3 = 0$

$I_1 = I_2 = I$

$U_1 = R_1 . I$

$U_2 = R_2 . I$

$U_3 = 0$

$U = U_2$

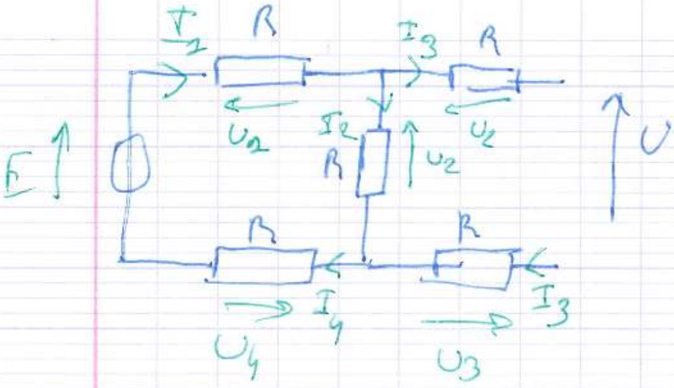
Pont diviseur

$U = \frac{E . R_2}{R_1 + R_2} = \frac{10V . 8k}{2k + 8k} =$

By Hyperion

Elektro

4/10



$$U = E \times \frac{R}{R+R+R}$$

$$E - U_1 - U_3 - U_{3II} - U_4 = 0$$

$I_3 = 0$

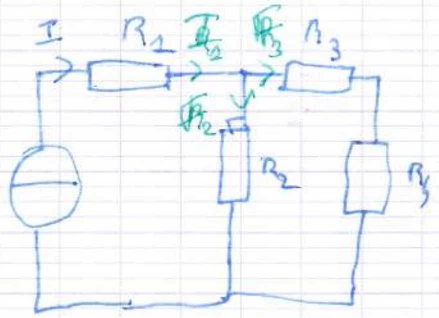
$U_1 = R_1 . I$

$U_2 = R_2 . I_2$

$$\boxed{E - U_1 - U_2 - U_4 = 0}$$

$\cancel{U_{3II} = U_3 - U_2}$

Exercice n°2:



$$\frac{1}{R_3+R_4} + \frac{1}{R_2}$$

$$\frac{1}{100+300} + \frac{2}{800} = \frac{3}{400} = \frac{400}{3}$$

$$\frac{400}{3}$$

$$+ 100\Omega = \frac{700\,\Omega}{3}$$

$U_1 = R_1 . I$

$U_1 = 100\,V$

$I = I_2 + I_3$

$U_{AB} = R_2 . I_2$

$I_2 = \frac{U_{AB}}{R_2} =$

$U_{AB} = (R_3 + R_4) I_3$

$U_{AB} = R_{AB} . I$

$$I_2 = \frac{U_{AB}}{R_2} = \frac{1}{R_2} \times I \times \frac{1}{\frac{1}{R_2} + \frac{1}{R_3+R_4}}$$

By Hyperion

$$I_2 = I \times \frac{\frac{1}{R_2}}{\frac{1}{R_2} + \frac{1}{R_3 + R_4}}$$

$$I_3 = I \times \frac{\frac{1}{R_3 + R_4}}{\frac{1}{R_2} + \frac{1}{R_3 + R_4}}$$

$U_0 = ?$

loi Ω $U_0 = -R_1 . I_0$

loi Maille $U_0 + U_1 - E_2 = 0$

$U_0 = E_2 - U_1 = E + R_1 . I_0$

$I_2 = ?$

$U_2 = R_2 . I_2$

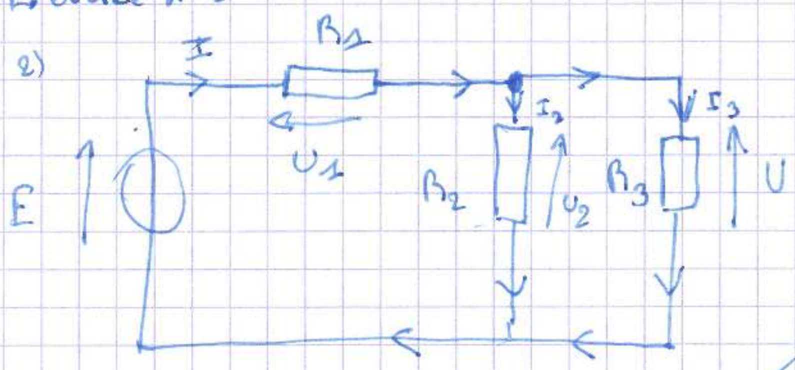
$E_2 + U_2 - E_3 = 0$

$U_2 = E_3 - E_2$

$I_2 = \frac{E_3 - E_2}{R_2}$

Exercice n°2

2)



Loi des mailles:

$$\begin{cases} \boxed{E - U_1 - U = 0} \leftarrow U = (E - U_1) \\ \cancel{E - U_2 - U = 0} \\ \cancel{U - U = 0} \end{cases}$$

Loi des noeuds:

$I = I_2 + I_3$ & $U_2 = U_3$

$I = \frac{U_2}{R_2} + \frac{U_3}{R_3}$

$$E - R_1 . I - R_2 . I_2 = 0$$

$$R_1 . I = R_2 . I_2 - E$$

$$I = \frac{R_2 . I_2 - E}{R_1} = \frac{R_2 . \frac{U_2}{R_2} - E}{R_1} = \frac{U_2 - E}{R_1}$$

$$I = \frac{U}{R} = \frac{U_2}{R_2} + \frac{U_3}{R_3}$$

$U = R . I$ $\quad E - U_1 - U_2 = 0$

$$I_2 = \frac{U_2}{R_2} \qquad I_3 = \frac{U_3}{R_3}$$

$$I_1 = I_2 + I_3 = \frac{U}{R_2} + \frac{U}{R_3} = U\left(\frac{1}{R_2} + \frac{1}{R_3}\right)$$

Loi d'ohm

$U_1 = R_1 I_1$
$U_2 = R_2 I_2$
$U_3 = R_3 I_3$

$$I_1 = (E - U_2)\left(\frac{1}{R_2} + \frac{1}{R_3}\right)$$

$$I_1 = (E - R_1 . I_1)\left(\frac{1}{R_2} + \frac{1}{R_3}\right)$$

$$I_1 = E\left(\frac{1}{R_2} + \frac{1}{R_3}\right) - R_1\left(\frac{1}{R_2} + \frac{1}{R_3}\right) I_1$$

Diviseur de tension

$$\frac{R_2 R_3}{R_2 + R_3}$$

Diviseur de courant

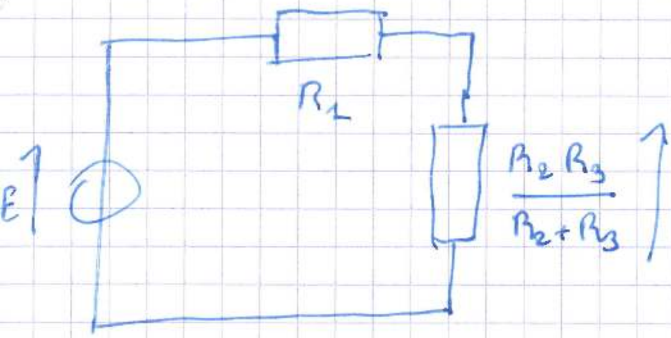
$$\frac{R_2}{R_2 + R_3}$$

$$R_{eq} = R_1 + \frac{R_2 R_3}{R_2 + R_3}$$

$$I_1 = \frac{E}{R_{eq}} = \frac{E}{R_1 + \frac{R_2 R_3}{R_2 + R_3}}$$

$$I_1 = \frac{64}{6{,}25 + \frac{10 \times 6}{10 + 6}} = \frac{64}{6{,}25 + \frac{60}{16}}$$

By Hyperion



$$U = \frac{E \times \frac{R_2R_3}{R_2+R_3}}{R_1 + \frac{R_2R_3}{R_2+R_3}}$$

$I_2 = \frac{U}{R_2}$ $\quad I_3 = \frac{U}{R_3}$

$I_1 = I_2 + I_3$

$$I_1 = E \cdot \frac{R_2+R_3}{R_2R_3} - R_1\left(\frac{R_2+R_3}{R_2R_3}\right) I_1$$

$$I_1\left(1 + \frac{R_1(R_2+R_3)}{R_2R_3}\right) = E \cdot \frac{R_2+R_3}{R_2R_3}$$

$$I_1\left(\frac{R_1(R_2+R_3)+R_2R_3}{\cancel{R_2R_3}}\right) = E \cdot \frac{R_2+R_3}{\cancel{R_2R_3}}$$

$$I_1 = \frac{E(R_2+R_3)}{R_2R_3 + R_1(R_2+R_3)}$$

$R_2 I_2 = R_3 I_3 \qquad I_3 = \frac{R_2}{R_3} I_2$

$I_2 = I_1 - I_3$

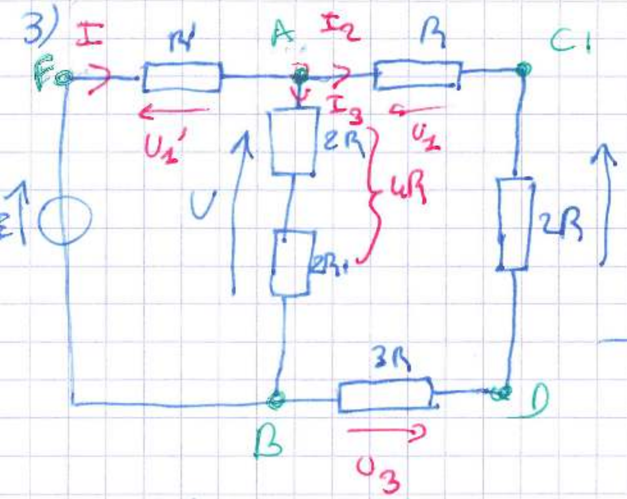
$I_2 = I_1 - \frac{R_2}{R_3} I_2 \qquad I_2\left(1 + \frac{R_2}{R_3}\right) = I_1$

$I_2 = \frac{R_3}{R_2+R_3} I_1$

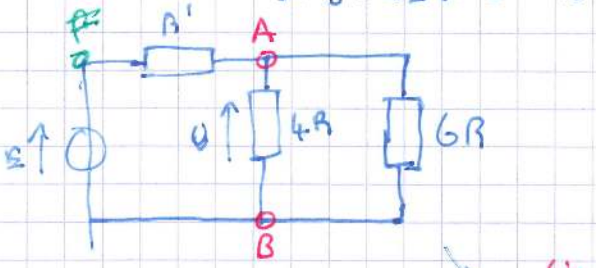
$$I_2 = \frac{E \times R_3}{R_2R_3 + R_1(R_2+R_3)}$$

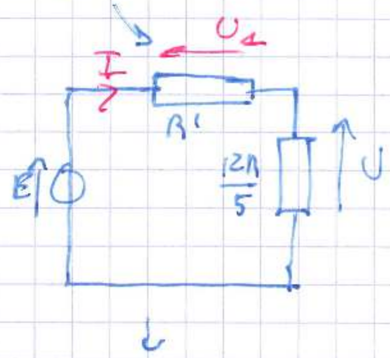
$$I_3 = \frac{E \times R_2}{R_2R_3 + R_1(R_2+R_3)}$$

3)



$\rightarrow$





Lois des mailles

$$\begin{cases} E - U_1' - U = 0 \\ E - U_1' - U_1 - U' - U_3 = 0 \\ U - U_1 - U' - U_3 = 0 \end{cases}$$

Lois des noeuds

$I = I_2 + I_3$

$I = \frac{U_2}{R_2} + \frac{U_3}{R_3}$

$E - U_1 - U = 0$

$U_1 = R' \cdot I$

$U = \frac{12R}{5} \cdot I$

$$U = \frac{E \times \frac{12R}{5}}{R' + \frac{12R}{5}} = \frac{E \times 12R}{5R' + 12R} = \frac{E}{4}$$

$48R = 12R + 5R'$

$R' = 36R/5$

2 $\leftarrow$

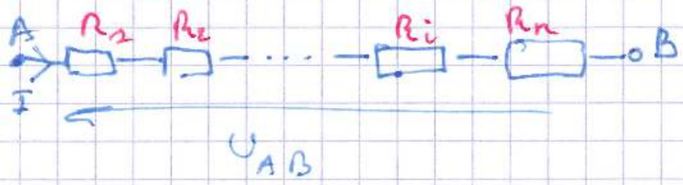
$U = \frac{E}{4}$ $\qquad U' = \frac{U \times 2R}{2R + R + 3R}$

$U' = \frac{U}{3} = \frac{E}{12}$

By Hyperion

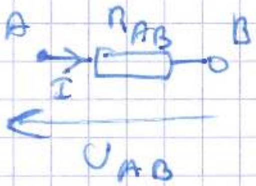
Diviseur de tension :

Association en série de résistance.

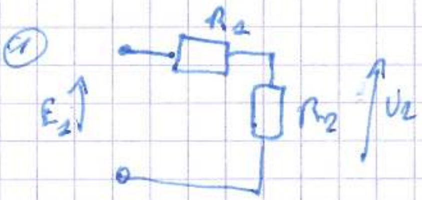


$U_i = R_i \cdot I$

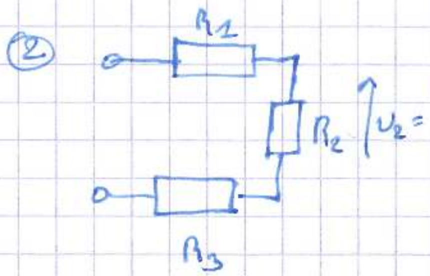
$$U_i = \frac{U_{AB} \cdot R_i}{\sum_1^n R_k}$$



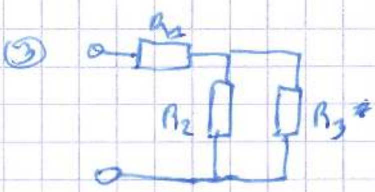
$$R_{AB} = \sum_1^n R_k$$



$$U_2 = \frac{E_1 \times R_2}{R_1 + R_2}$$

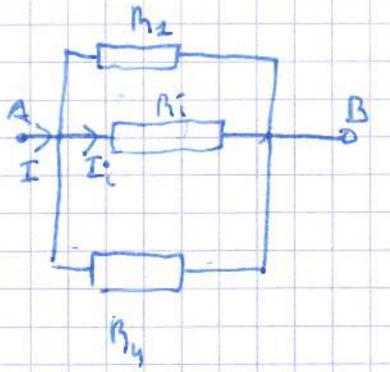


$$U_2 = \frac{E_1 \times R_2}{R_1 + R_2 + R_3}$$



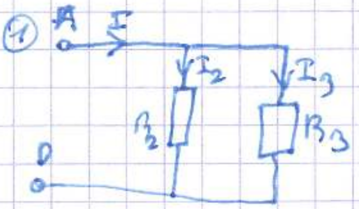
Diviseur de courant

Association de parallèle de résistance



$I_i = U_{AB} \cdot G_i$

$$I_i = \frac{I \cdot G_i}{\sum_1^n G_k}$$



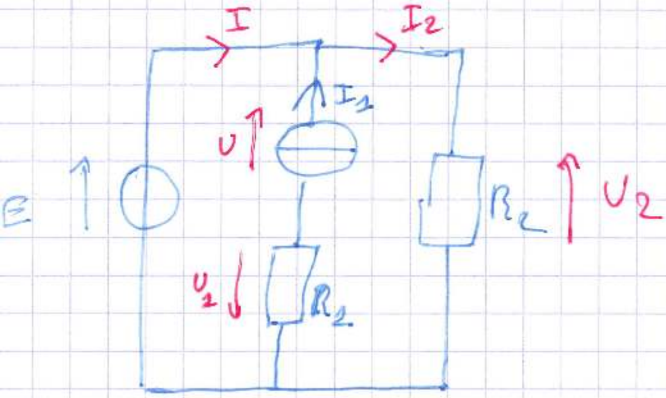
$$I_2 = \frac{I \times G_2}{G_2 + G_3} = \frac{I \times \frac{1}{R_2}}{\frac{1}{R_2} + \frac{1}{R_3}} = \frac{I \times R_3}{R_2 + R_3}$$

By Hyperion

$$I_1 = \frac{I \times \frac{1}{3}R}{\frac{1}{3}R + \frac{1}{R}} = \frac{1}{4} I$$

Tension → Loi d'Ohm

Courant → Loi des Mailles



Loi des noeuds :

$I_2 = I + I_1$

Loi des mailles

$E - U_2 = 0$

$E - U + U_1 = 0$

Loi d'Ohm :

$U_1 = R_1 . I_1 \qquad U_2 = R_2 \cdot I_2$

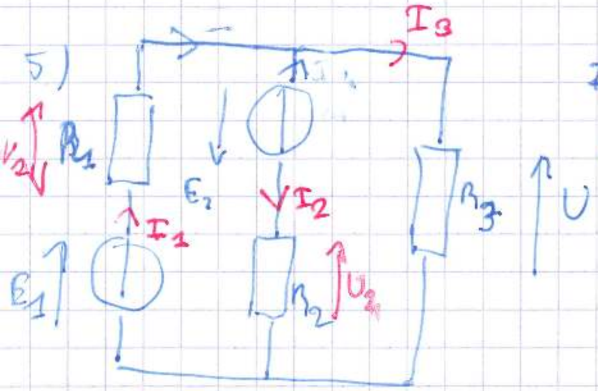
$$\begin{cases} E = R_2 . I_2 \\ E - U + R_1 . I_1 = 0 \\ I_2 = I + I_1 \end{cases}$$

$$\boxed{U = E + R_1 . I_1}$$

$I = I_2 - I_1$

$$\boxed{I = \frac{E}{R_2} - I_1}$$

5)



Loi des noeuds :

$I_1 = I_2 + I_3$

Loi des mailles

$E_1 - U_1 - U = 0$

$E_1 - U_1 + E_2 - U_2 = 0$

$U_2 - E_2 - U = 0$

Loi d'Ohm :

$U = R_3 . I_3$

$U_1 = R_1 . I_1$

$U_2 = R_2 . I_2$

$$\begin{cases} U = E_1 - U_1 \\ U_1 = R_1 . I_1 \\ I_1 = I_2 + I_3 \end{cases}$$

$$\begin{cases} U = U_2 - E_2 \end{cases}$$

$$\begin{cases} U = R_2 . I_2 - E_2 \\ U = E_1 - R_1 . I_1 \end{cases}$$

By Hyperion