Correction TP
Circuit à courant continu

1. Identification des différentes résistances

1-1.

R_1 : Marron 1
Rouge 2
Jaune 10^4

$R_1 = 12 \cdot 10^4 = 120 \cdot 10^3\ \Omega$
soit $R_1 = 120\ k\Omega$

R_2 : Vert 5
bleu 6
orange 10^3

$R_2 = 56 \cdot 10^3\ \Omega$
soit $R_2 = 56\ k\Omega$

R_3 : Marron 1
Noir 0
orange 10^3

$R_3 = 10 \cdot 10^3\ \Omega$
soit $R_3 = 10\ k\Omega$

1.2- Valeur mesurée à l'ohmètre

$R_1 = 125,43\ k\Omega$

$R_2 = 55,3\ k\Omega$

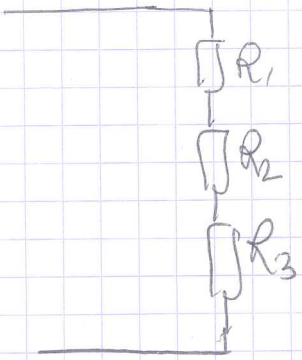
$R_3 = 9,83 k\Omega$

Les valeurs correspondent aux valeurs du code des couleurs.

2. Association de résistances.

2.1 Manip.

2.2



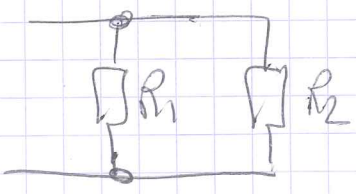
2.3. $R_{equ\ res.} = 190,5\ k\Omega$

2.4. $R_{eq\ série} = R_1 + R_2 + R_3$

2.5 $R_{eq} = R_1 + R_2 + R_3 + \dots + R_n$.

2.6 Manip.

2.7



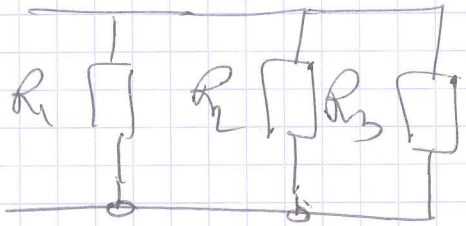
2.8. $Req_{12} = 38,35\ k\Omega$

2.9. $$Req_{12} = \frac{R_1 \cdot R_2}{R_1 + R_2}$$
$$= \frac{125 \times 56}{125 + 56} = 38,67\ k\Omega$$

On retrouve bien la valeur mesurée.

2.10 Idem

2.11



2.12. $Req_{123} = 7,82\ k\Omega$

2.13 $$\frac{1}{Req_{123}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

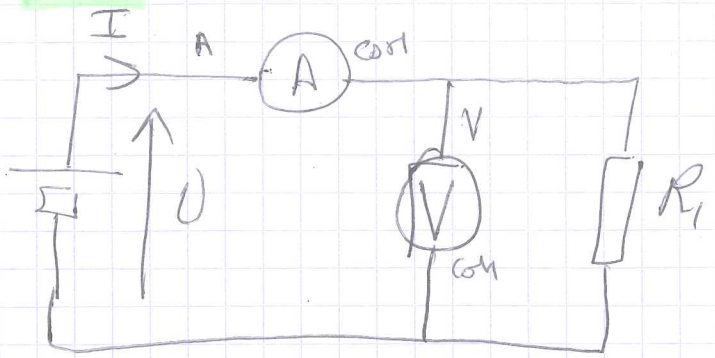
$$Req_{123} = \frac{1}{\frac{1}{125} + \frac{1}{56} + \frac{1}{10}}$$

$$Req_{123} = 7,94\ k\Omega$$

On retrouve bien la mesure précédente

2. Vérification de la loi d'Ohms.

3.1.



3.2. $U = 22,91$ V

$I = 185,3.10^{-6}$ A

3.3 $\frac{U}{I} = \frac{22,91}{185,3.10^{-6}} = 0,1236.10^{6}$

$= 123,6.10^{3} = 123,6\,k\Omega$

3.4. $R_1 = 125.\ k\Omega$

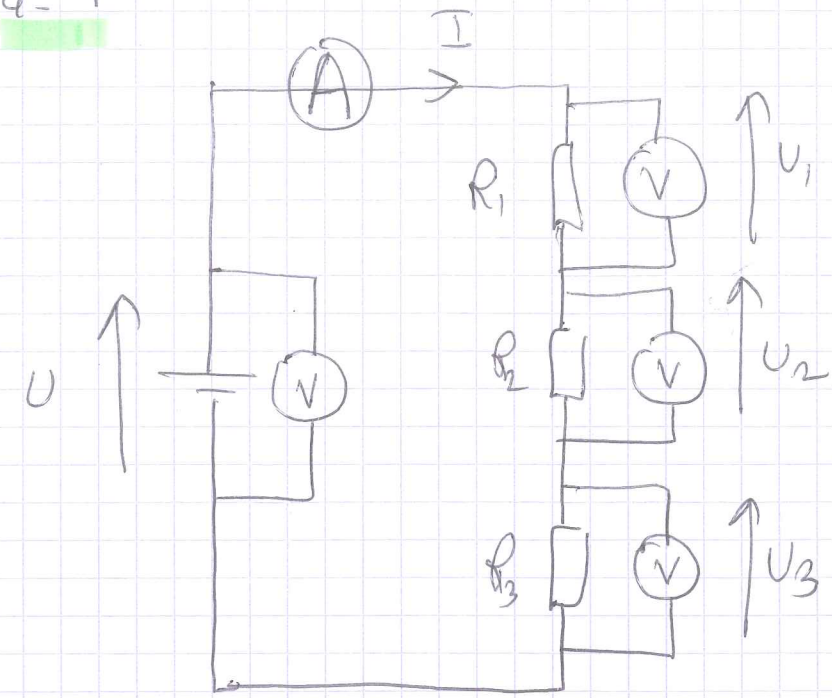
Les valeurs correspondent.

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

ou $U = RI$

4. Loi des mailles.

4-1



4.2. $I = 125{,}72\,\mu A$

$U_1 = 15{,}69$ V

$U_2 = 6{,}93$ V

$U_3 = 1{,}23$ V

$U = 23{,}95$ V

4.3. $U_1 + U_2 + U_3 = 23{,}85$ V.

On remarque que la somme correspond à U.

4.4. La somme des tensions le long d'une maille est nulle

$$U - U_1 - U_2 - U_3 = 0$$

$$U = U_1 + U_2 + U_3$$

4.5 $$I = \frac{U}{R_{eq}} = \frac{U}{R_1 + R_2 + R_3}$$

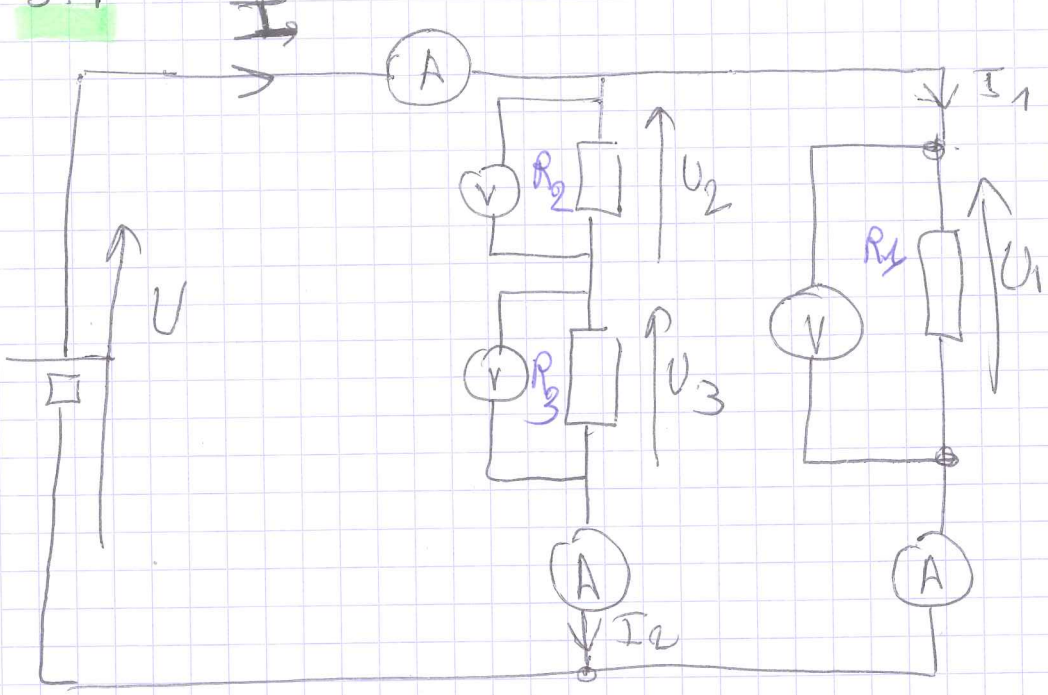
$$I = \frac{24}{(125 + 56 + 10).10^3} = 125,65\ \mu A$$

(en mA)

4-6. Les valeurs correspondent.

5. loi des noeuds.

5.1.



5.2. $I_1 = 190,73\ \mu A$ $U_1 = 23,91\ V$

$I_2 = 366,06\ \mu A$ $U_2 = 20,23\ V$ $U_3 = 3,6\ V$

$I_1 + I_2 = 556,78\ \mu A$

5.3 On remarque que $I = 556,8\ \mu A$ correspond à la somme des courants I_1 et I_2

5.4. La somme des courants entrants dans un noeud est égale à la somme des courants sortants

5.5. $I_1 = \frac{U_1}{R_1} = \frac{23,91}{125k} = 191,28\mu A$

5.6. $R_{equ1} = R_2 + R_3 = 56 + 10 = 66k\Omega$

5.7. $I_2 = \frac{U_2 + U_3}{R_{equ1}} = \frac{U}{R_{equ1}}$

$I_2 = \frac{20,23 + 3,6}{66} = 361,06\mu A$

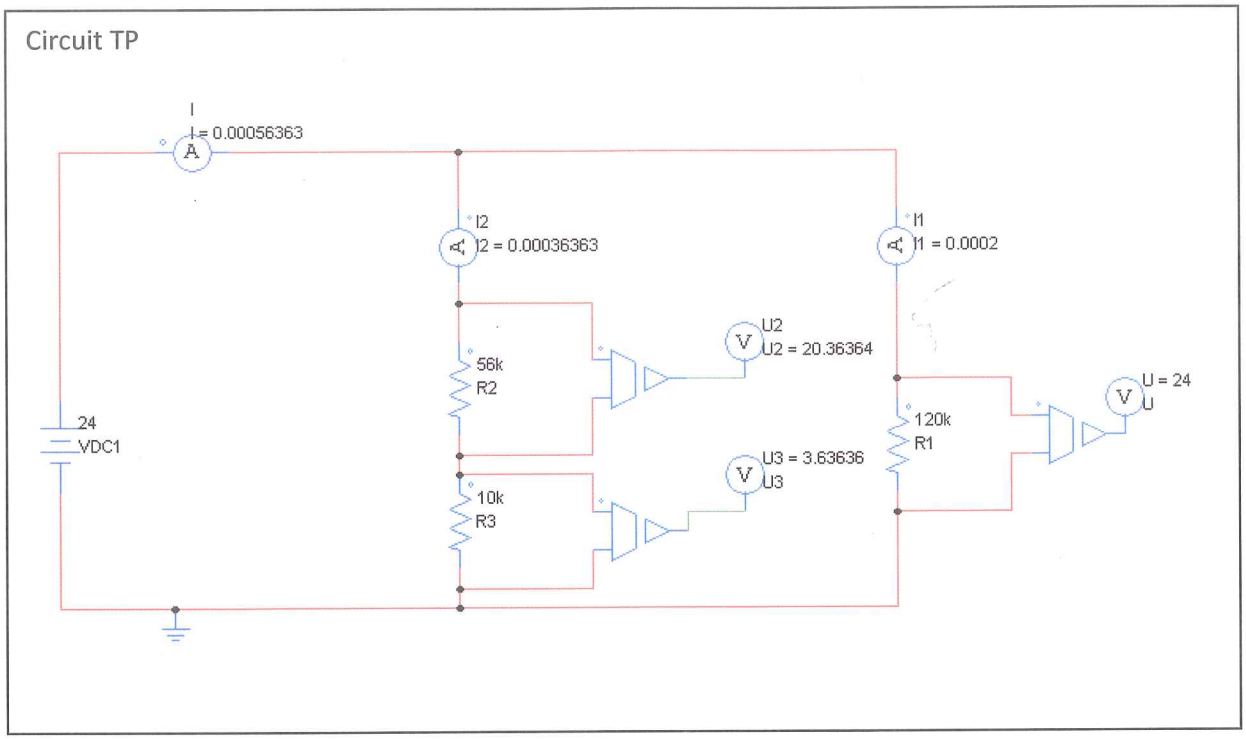
5.8. $R_{equ2} = \frac{R_1 \times R_{equ1}}{R_1 + R_{equ1}}$

$= \frac{125 \times 66}{125 + 66} = 43,193\ k\Omega$

5.9. $I = \frac{U}{R_{equ2}} = \frac{23,91}{43,193} = 553,56\mu A$.

On retrouve bien la mesure.

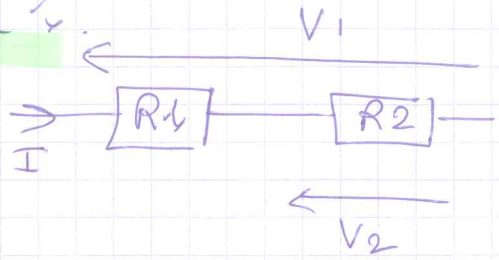
Simulation exercices sous Psim 9.1



7 Exercices à résoudre

Exercice 1 :

1-



$$I = \frac{V_1}{R_1 + R_2} \qquad V_2 = R_2 \times I$$

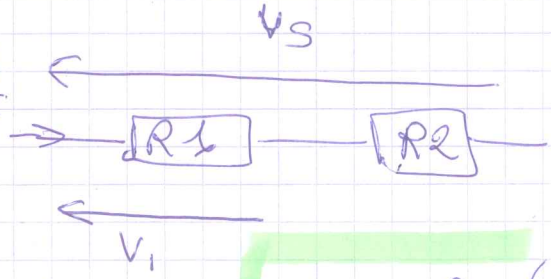
$$V_2 = R_2 \times \frac{V_1}{R_1 + R_2}$$

2- A.N :

$$V_2 = \frac{2}{1+2} \times 12 = \frac{2}{3} \times 12^{4}$$

$$V_2 = 8\,V.$$

Exercice 2 :



1- $I = \frac{U_s}{R_1 + R_2}$ $\qquad V_1 = R_1 \times \left(\frac{U_s}{R_1 + R_2}\right)$ (I : II)

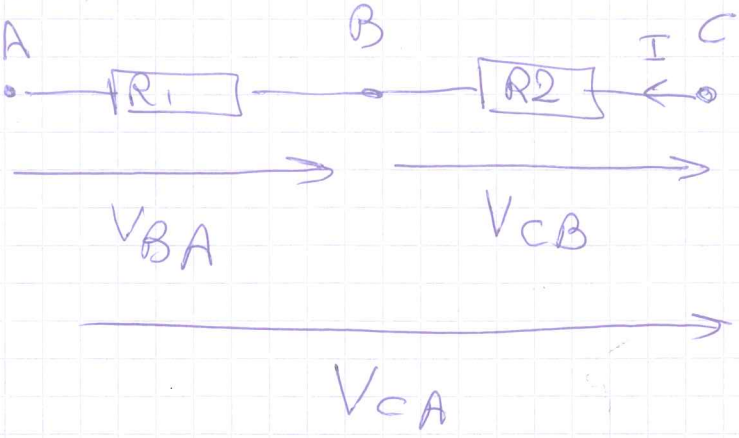
2- A.N

$$V_1 = \left(\frac{R_1}{R_1 + R_2}\right) \times U_s$$

$$V_1 = \frac{4,7}{4,7+6,7} \times 9 = \frac{4,7}{11,5} \times 9 = 3,64\,V.$$

Exercice 3 :

1-



2- $I = \dfrac{V_{CA}}{(R_1+R_2)}$

$V_{CB} = R_2 . I = R_2 \times \dfrac{V_{CA}}{(R_1+R_2)}$

$V_{BA} = R_1 I = R_1 \times \dfrac{V_{CA}}{(R_1+R_2)}$

3- $V_{CB} = \dfrac{R_2}{(R_1+R_2)} \times V_{CA} = \dfrac{270}{820+270} \cdot 3$

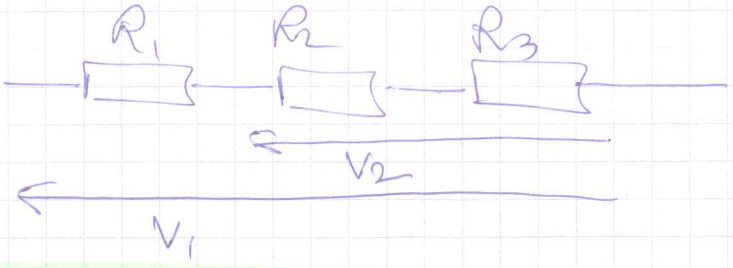
$V_{CB} = 0,74 . V$

D'où $V_{BA} = V_{CA} - V_{CB} = 3 - 0,74$

$V_{BA} = 2,25 V.$

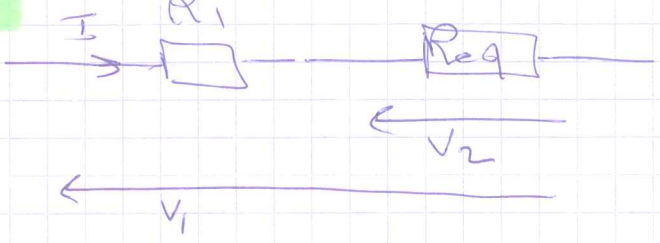
Exercice 4 :

1-



$$R_{eq} = R_2 + R_3$$

D'où



2-

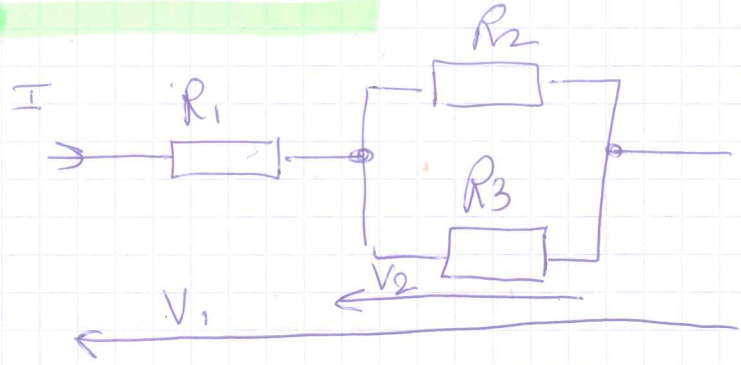
$$I = \frac{V_1}{R_1 + R_{eq}}$$

$$R_{eq} = R_2 + R_3 = 18 + 22 = 40\ k\Omega$$

$$V_2 = R_{eq} \times I = \frac{R_{eq} \times V_1}{(R_1 + R_{eq})} = \frac{40 \times 10}{68 + 40}$$

$$V_2 = \frac{400}{108} = 3{,}703\ V$$

Exercice 5 :



1 - $R_{eq} = \dfrac{R_2 \times R_3}{R_2 + R_3} = \dfrac{1,2 \times 3,3}{1,2 + 3,3}$

$R_{eq} = 0,88\ k\Omega$

d'où

2 - $R_{eq} = 0,88\ k\Omega$

3 - $I = \dfrac{V_1}{R_1 + R_{eq}}$

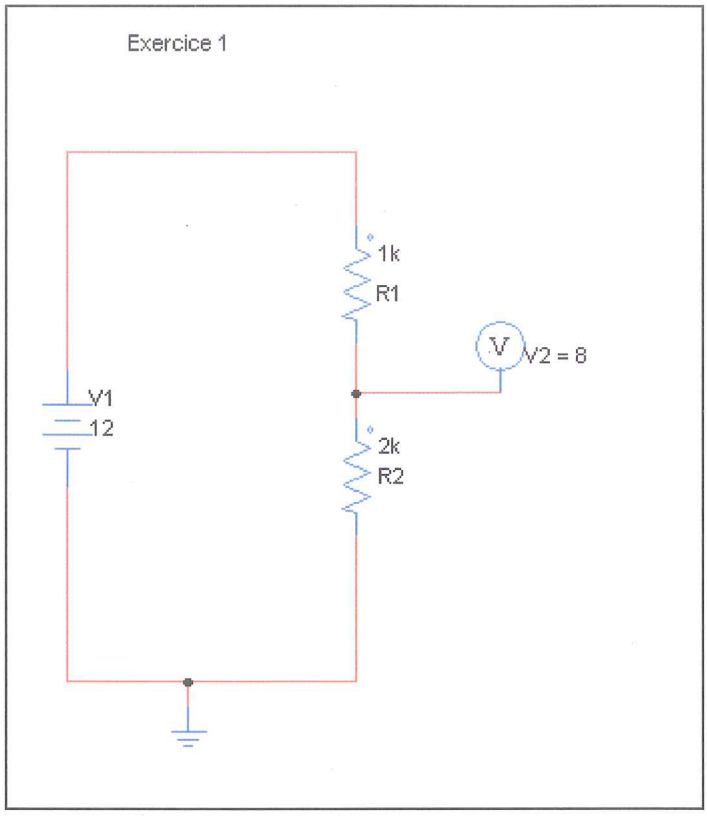
$V_2 = R_{eq} \times I$

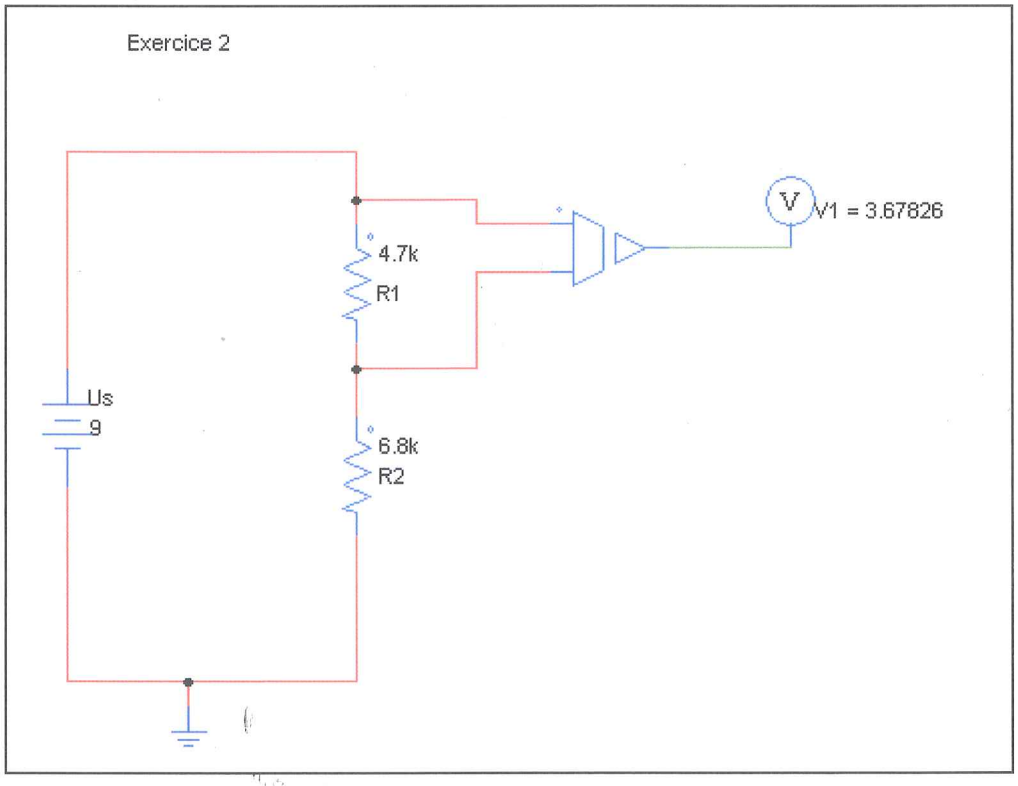
$= R_{eq} \times \dfrac{V_1}{R_1 + R_{eq}} = \dfrac{0,88}{2,7 + 0,88} * 14$

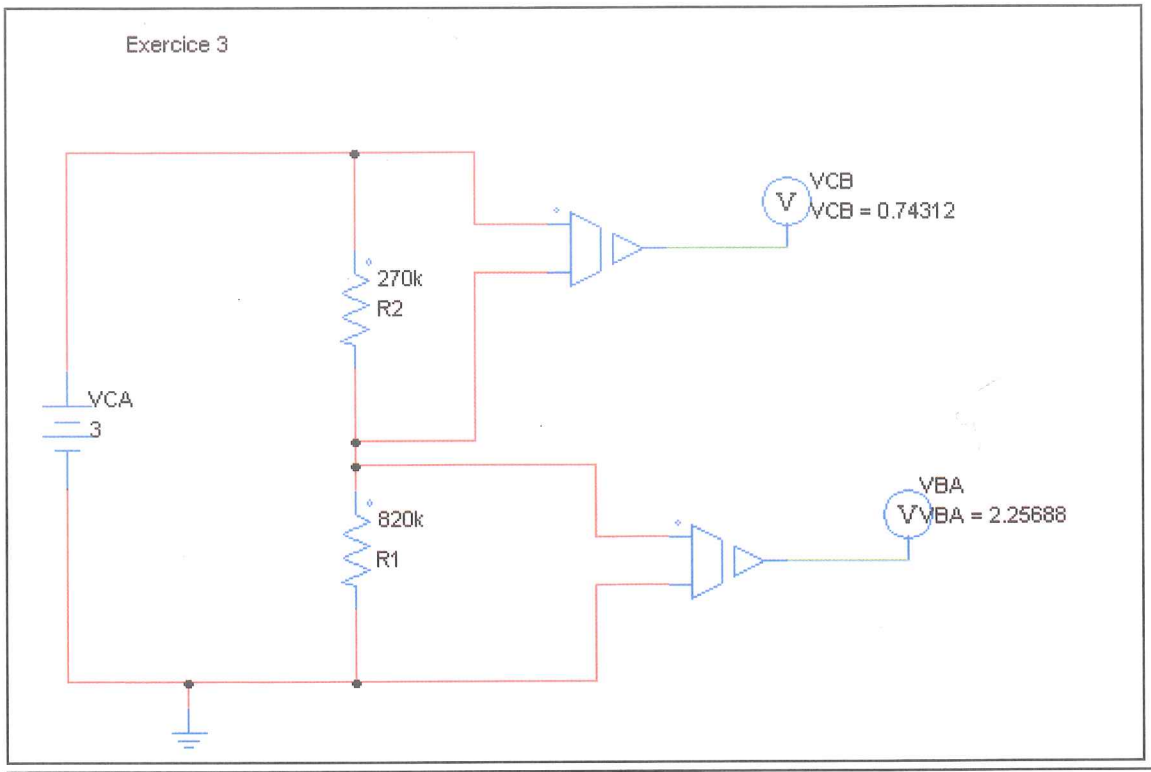
$V_2 = 0,24 \times 14 = 3,44\ V$

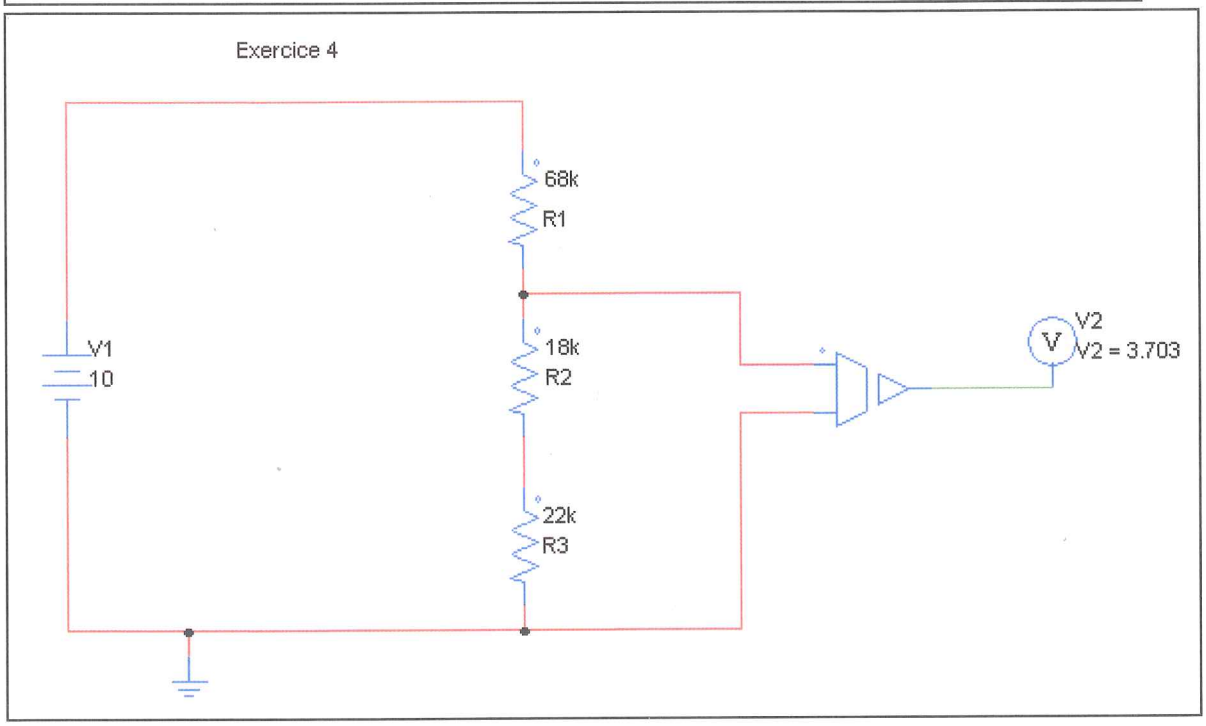
$V_2 = 3,44\ V$

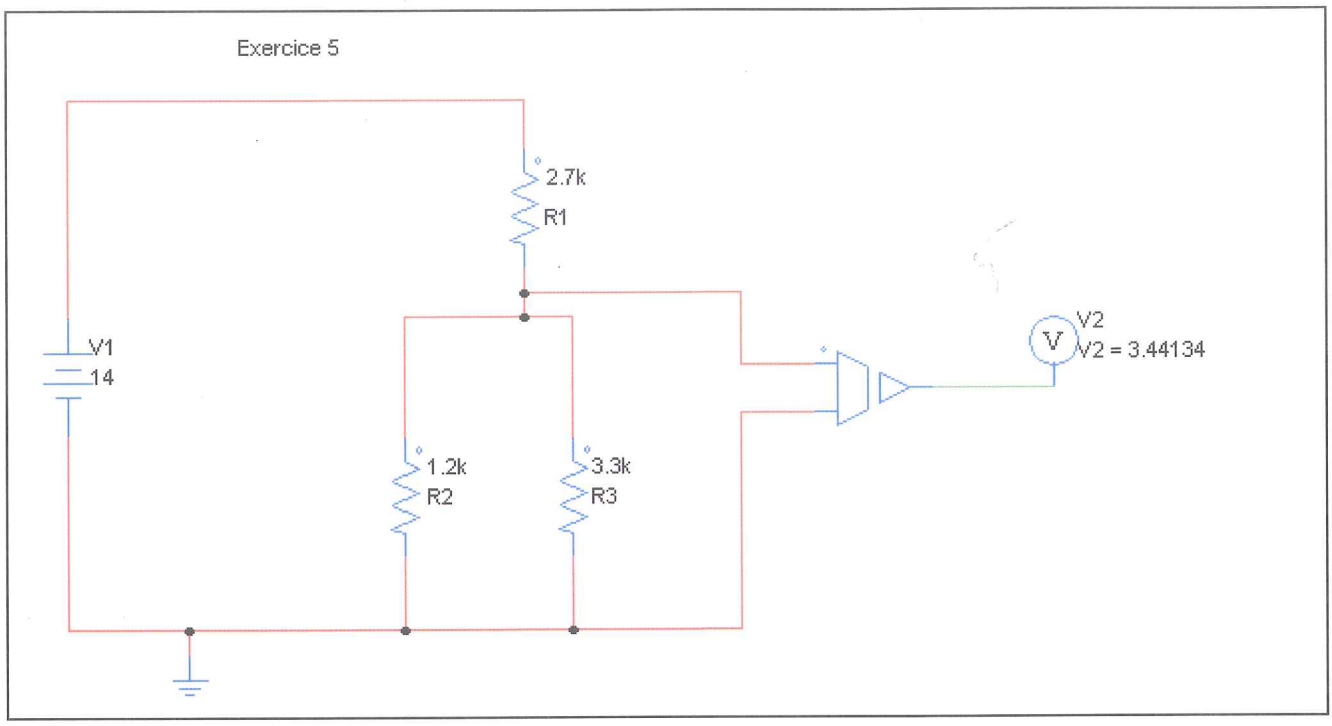
Simulation exercices sous Psim 9.1






Exercice 3
VCB
VCB = 0.74312
270k
R2
VCA
3
820k
R1
VBA
VBA = 2.25688


Exercice 4
68k
R1
V1
10
18k
R2
V2
V2 = 3.703
22k
R3


Exercice 5
2.7k
R1
V1
14
1.2k
R2
3.3k
R3
V
V2
V2 = 3.44134