

Nom, Prénom : BERNARD J

Mesures Physiques 1^{ère} année

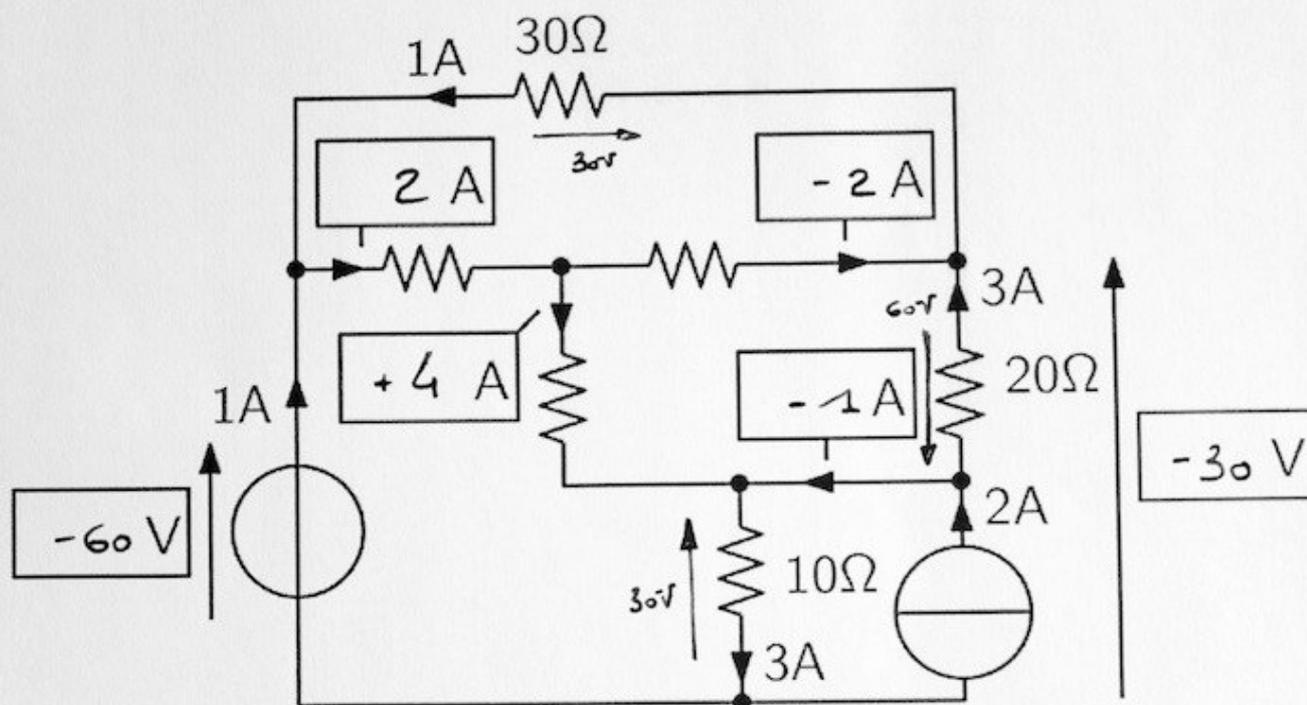
Devoir d'Electricité 1

Octobre 2011

1h20

- Le sujet est à rendre avec votre copie
- Aucun document autorisé
- Calculatrice autorisée

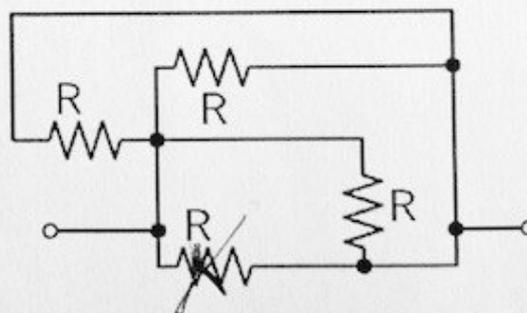
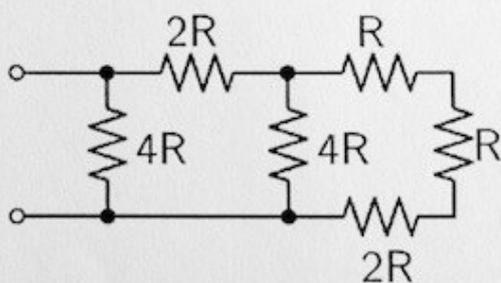
Exercice 1 – Loi des nœuds, loi des mailles, loi d'ohm [4 points]



1. En utilisant la loi des nœuds, trouver la valeur des courants inconnus (écrire vos réponses directement sur le sujet).
2. En utilisant la loi des mailles et la loi d'ohm, trouver la valeur des tensions inconnues.

Exercice 2 – Résistance équivalente

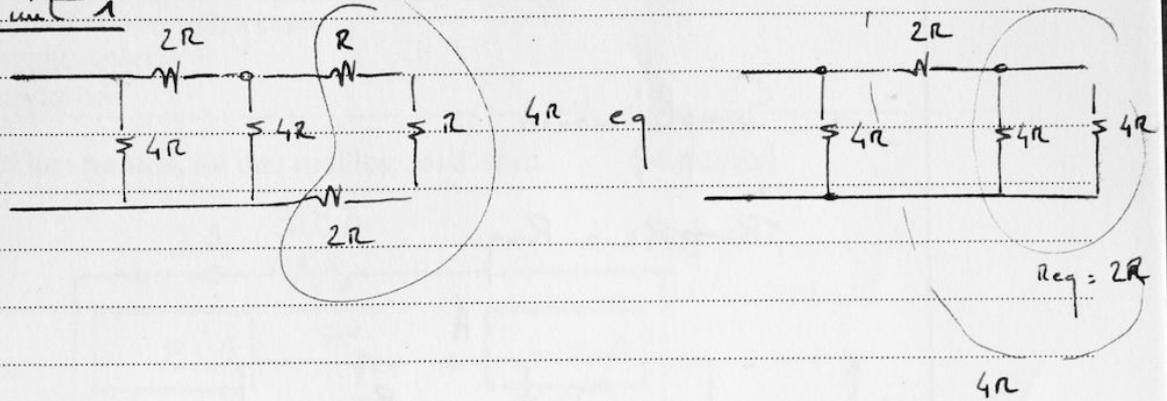
[4 points]



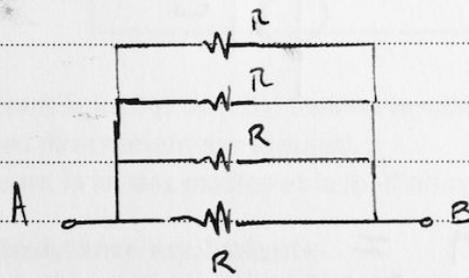
Calculer la résistance équivalente entre les deux bornes des deux circuits donnés ci-dessous.

Ex 2

Circuit 1



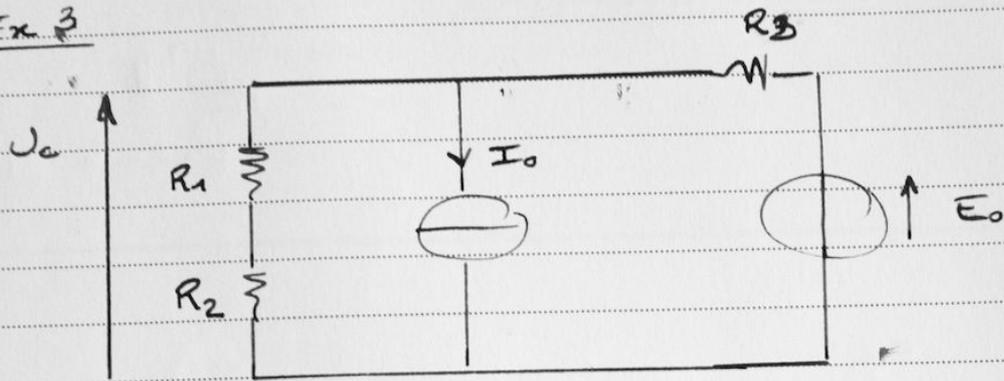
Circuit 2



$$\frac{1}{R_{eq}} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R} + \frac{1}{R}$$

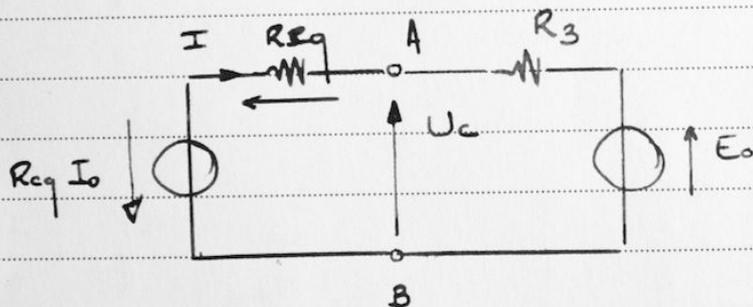
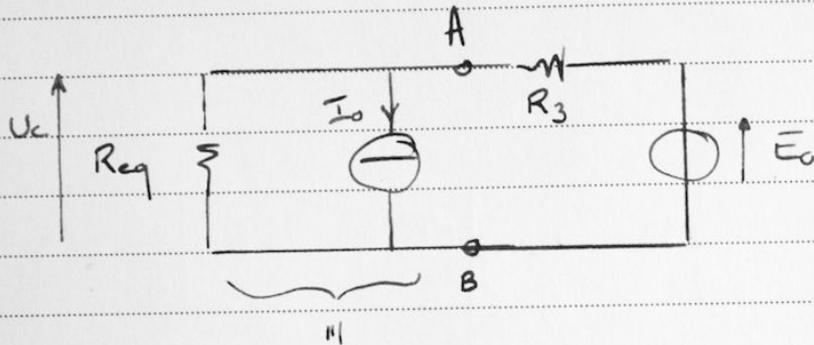
$$R_{eq} = \frac{R}{4}$$

Ex 3

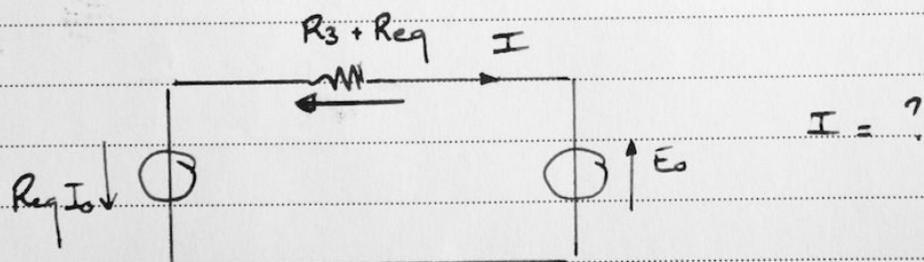


1. Simplifications

$$R_1 + R_2 = R_{eq}$$



2



$$R_{eq} I_0 + E_0 + (R_3 + R_{eq}) I = 0$$

$$I = - \frac{E_0 + R_{eq} I_0}{R_3 + R_{eq}}$$

$$U_c = - (R_{eq} I_o + R_{eq} I)$$

$$U_c = -R_{eq} \left(I_o + \frac{E_o + R_{eq} I_o}{R_3 + R_{eq}} \right)$$

$$U_c = R_{eq} I_o \left(\frac{E_o / I_o + R_{eq}}{R_3 + R_{eq}} - 1 \right)$$

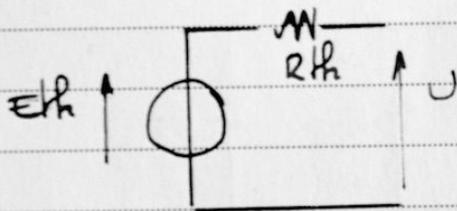
$$U_c = R_{eq} I_o \left(\frac{E_o / I_o + R_{eq} - R_3 - R_{eq}}{R_3 + R_{eq}} \right)$$

$$U_c = \frac{R_{eq}}{R_3 + R_{eq}} \left(\frac{E_o}{I_o} - R_3 \right) I_o$$

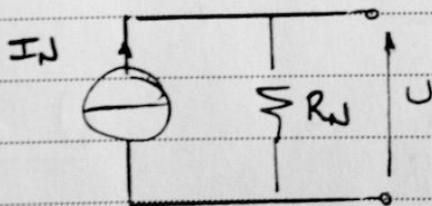
$$U_c = 10V$$

Ex 4

↳ Source de Thévenin

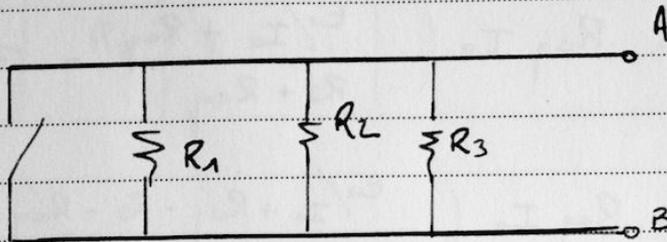


Source de Norton



2 - Circuit equivalent

① Calcul de R_{th}

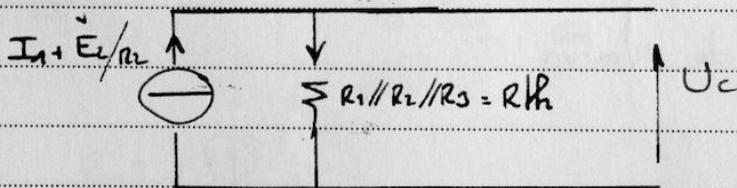
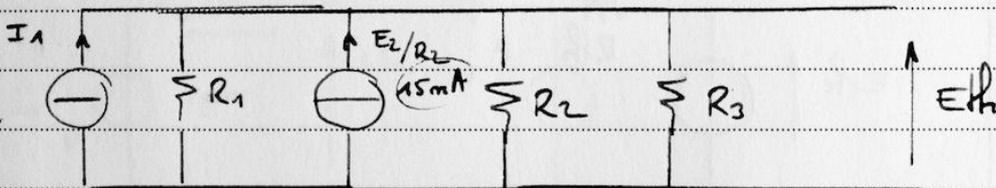


$$\frac{1}{R_{th}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$R_{th} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

$R_{th} = 500 \Omega$

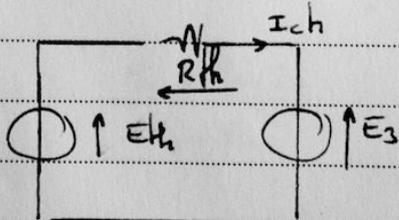
② Calcul de E_{th}



$$U_c = R_{th} \left(I_1 + \frac{E_2}{R_2} \right)$$

$U_c = 12,5V$

3



$$E_{th} = R_{th} I_{ch} + E_3$$

$$I_{ch} = \frac{E_{th} - E_3}{R_{th}}$$

$I_{ch} = 5mA$