EPITA / InfoS1 November 2017

NAME : …….. Firstname: …….. Group : ……

Electronics Midterm

Calculators and extra documents are not allowed. The marking scale is given as a rough guide.

Please answer only on exam sheets. If more space is needed, write on the back.

Exercise 1. Questions about lecture topics (5 points – no negative points for the MCQ)

A. Choose the correct answers:

1. A potential difference between 2 points is called:

   a- A current
   b- A voltage
   c- A power
   d- A conductance

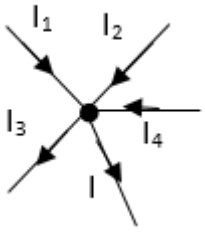
2. To measure the current intensity in some dipole, one uses an ammeter which is in series with that dipole.

   a- TRUE
   b- FALSE

3. The incoming current in a generator has a lower intensity than the outgoing one.

   a- TRUE
   b- FALSE

4. In the following sketch one considers the currents:



$$I_1 = 5mA\ ;\ I_2 = 1mA;\ I_3 = 1mA;\ I_4 = -3mA$$

Compute current I.

   a- $I = 4\ mA$
   b- $I = 2\ mA$
   c- $I = 10\ mA$
   d- $I = 8\ mA$

5. If two resistors in parallel are associated, one conserves:

   a- The current flowing through them
   b- The voltage at their terminals
   c- Nothing

B. Consider the following resistances $R_1 = 1\,\Omega$ and $R_2 = 1\text{k}\Omega$. Compute the equivalent resistances:

1. R_2 and R_2 in series

2. R_1 and R_2 in series

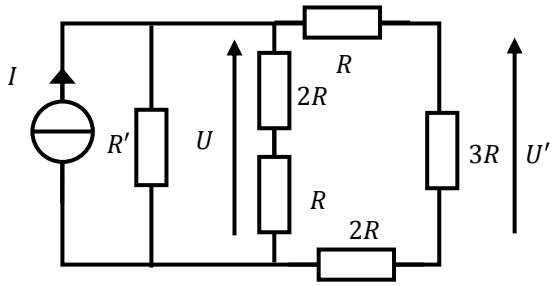
3. R_1 and R_1 in parallel

4. 10 resistances R_1 in series

5. 10 resistances R_2 in parallel

Exercise 2. Generalities and Kirchhoff's laws (6 points)

Let us consider the following circuit for which I and R are known.

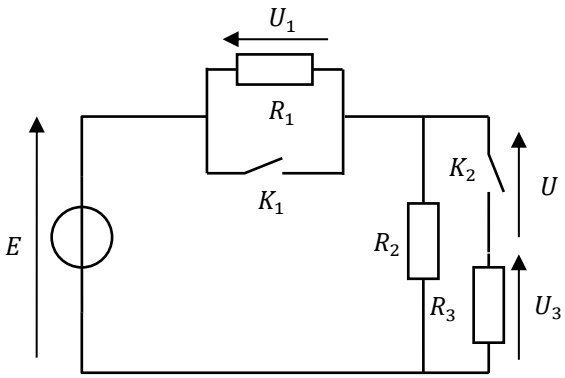


1. Express the resistance R' in terms of R to get $U = \frac{R.I}{4}$.

2. Write the expression of the voltage U' in terms of *I* and resistances (still consider $U = \frac{R.I}{4}$).

Exercise 3. Kirchhoff's laws (4.5 points)

Consider the following circuit:



Note: the expected answers depend on the states of the switches and are independent from each other: so, this is not a "long" exercise but rather 4 "short" ones starting with the same sketch. Draw it on your draft to answer questions correctly. Start by solving the cases that you find the simplest!

We assume that the voltage E and the three resistances are known.

Fill out the following table (only the result, no computation details). The voltages must depend **ONLY on E and/or resistances R_1, R_2 or R_3** (except if these are vanishing!) **and NOT on each other!!**

Ask yourselves the right questions… you will get the right answers!!

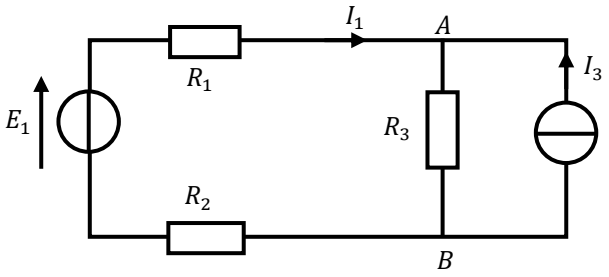
K_1	K_2	U_1	U_3	U
O	O			
O	F			
F	O			
F	F			

Note : O = Opened
C = Closed

Exercise 4. Superposition theorem (2,5 points)

Consider the following circuit:

Determine the expression of I_1 in R_1 in terms of $E_1,\ I_3,\ R_1,\ R_2,\ R_3$ by using superposition theorem.



Exercise 5. Resistors association (2 points)

What is the total equivalent resistance? (Detail your reasoning – let us imagine that the current «goes in» at point A and «goes out» at B)