

## Midterm exam of Electronics

***Calculators and documents are not allowed. The number of points per question is indicative.  
Answers to be written on this document only. If you need more space, you can use the back of the sheets.***

### Exercise 1. Course questions: MCQ (6,5 points – without negative points)

Choose the correct answers.

1. A random displacement of electric charges represents :
 

a- A resistor

b- A voltage

c- A current

d- None of this
  
2. Depending on the dipole, the entering current to this dipole may be higher or lower than the going out current.
 

a- Right

b- False

3. We consider the following diagram:
 

A

B

We measure the current and the voltage, we get  $I_{AB} < 0$  and  $U_{AB} > 0$ . The two-terminals is:

- a- A load

b- A source
4. The Volts per Amperes represent:
 

a- Ohms

b- Siemens

c- Joules

d- None of this
  
  5. A branch in an electric circuit is :
 

a- A portion of the circuit between two consecutive nodes.

b- A wire connecting two dipoles.

c- A portion of circuit containing a source.

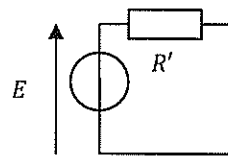
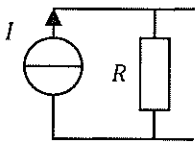
d- A portion of circuit containing a resistor.
  
  6. When we associate together two resistors  $R_1$  and  $R_2$  in parallel, we conserve:
 

a- The voltage across  $R_1$

b- The current flowing through  $R_1$

- c- None of this
7. A short-circuited resistor has:
- a- An infinite current flowing through it      c- The voltage across its terminals is zero
- b- An infinite voltage across its terminals      d- None of this
8. If we apply the Ohm's law using  $R$  in  $k\Omega$  and  $I$  in  $mA$ , we obtain  $U$  in :
- a.  $kV$       b.  $V$       c.  $mV$       d.  $MV$
9. To turn-off a current source we replace it by:
- a- A wire      c- A resistor
- b- An open switch      d- A voltage source
10. To turn-off a voltage source, we replace it by :
- a- A wire      c- An open switch
- b- A resistor      d- A current source

We consider the two following circuits:

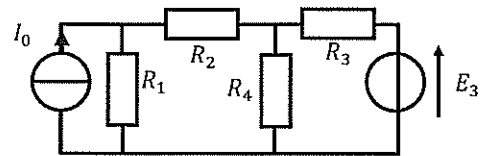


These two circuits are equivalent if and only if:

11.  $E =$
- a-  $I$       c-  $\frac{R' \cdot R}{R + R'} \cdot I$
- b-  $R \cdot I$       d- None of this
12.  $R' =$
- a-  $R$       c-  $\frac{R}{R + R'}$
- b-  $\frac{R \cdot R'}{R + R'}$       d- None of this
13. The Millman's theorem is based on:
- a- The Thevenin's theorem      c- The node's law (KCL)
- b- The loop's law (KVL)      d- The superposition's theorem

Exercise 2. The Norton's theorem (6 points)

We consider the following circuit, where  $R_1 = R_2 = R_3 = R_4 = R$ .

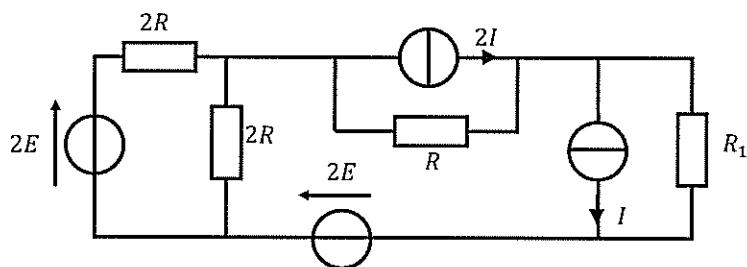


1. Determine the current Norton source seen by  $R_4$ . You can choose the method that you want (The Thevenin-Northon equivalence or the Northon's theorem), and you express the result function of  $I_0$ ,  $E_3$  and  $R$ .

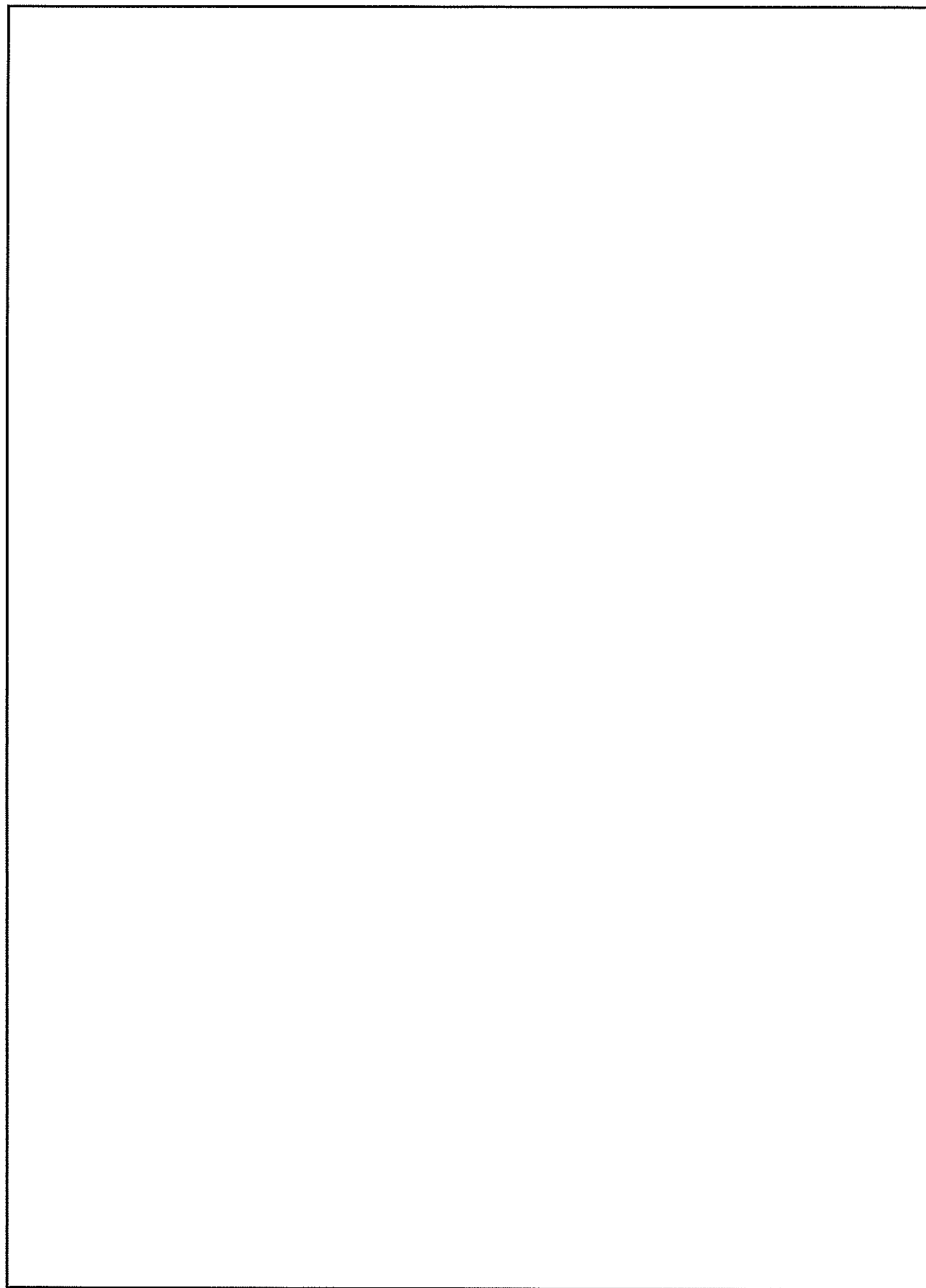
2. Deduce the current flowing through  $R_4$ .

**Exercise 3.** Theorems (7,5 points)

We consider the following circuit:



Express the voltage across the resistor  $R_1$  function of  $E$ ,  $I$ ,  $R$  and  $R_1$ , using the method that you want.



**BONUS**

We consider the following circuit.  
Determine the voltage  $U$  using the  
Millman's theorem.

