



Electronic Control

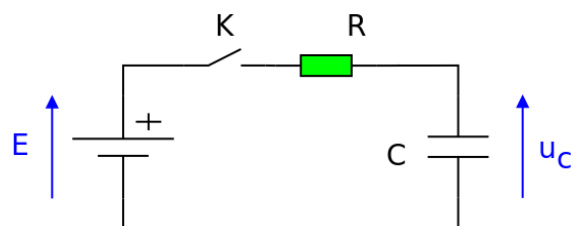
*Calculators and documents are not allowed. The scale is indicative.
Answers exclusively on the subject. If you run out of space, you can use
the back of the pages.*

Exercise 1. Course questions (4 points – no negatives)

Choose the correct answer(s):

1. Millman's theorem comes from:
 - a. The nodes law
 - b. The law of meshes
2. What is the unit of the capacitance C of a capacitor?
 - a. Ohm (Ω)
 - b. Farad (F)
 - c. Henry (H)
 - d. Mathieu (M)
3. What is the unit of the inductance L of a coil ?
 - a. Ohm (Ω)
 - b. Farad (F)
 - c. Henry (H)
 - d. Mathieu (M)
4. In continuous steady state (DC), a coil can be replaced by:
 - a. a capacitor
 - b. an open switch
 - c. a wire
 - d. a resistor

Consider the next circuit, where E is a source of DC voltage. The capacitor is initially discharged. At $t = 0$, we close the switch K

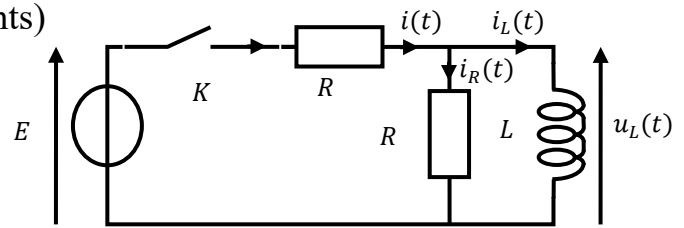


5. What is worth u_C right after closing K.
 - a. 0
 - b. E
 - c. $\frac{E}{R}$
 - d. $R.E$
6. What is worth u_C when the steady state is reached.
 - a. 0
 - b. E
 - c. $\frac{E}{R}$
 - d. $R.E$

Exercise 2. Transitional arrangements (10 points)

Consider the next circuit. The switch has been open long enough for all currents to be zero.

At $t = 0$, the switch K is closed.

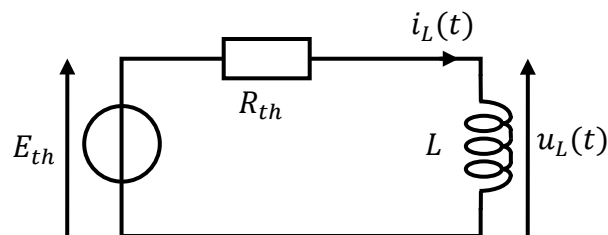
**Figure 1**

1. Complete the following table:

	i	i_R	i_L	u_L
$t = 0^+$				
$t \rightarrow \infty$				

2. We want to determine the equation of the voltage $u_L(t)$ across the coil. For this, we will try to simplify the circuit, using the Thévenin/Norton equivalences.

- a. Determine E_{th} and R_{th} so that the circuit in Figure 2 is equivalent to that in Figure 1.

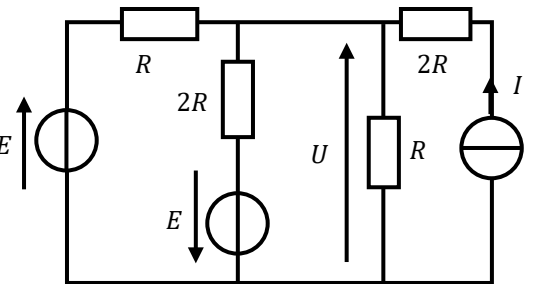
**Figure 2**

- b. Using the previous results (Figure 2 diagram), establish the differential equation that describes the evolution of u_L over time, and then determine the expression of $u_L(t)$. You will give this equation as a function of E , R and L . What is the time constant τ of this circuit?



Exercise 3. Millman's theorem (6 points)

1. Consider the circuit opposite. Using Millman's theorem, $2E$ determine the expression of the voltage U .



2. Consider the circuit opposite. Using Millman's theorem, determine the expression of the voltage U .

