UNIVERSIDAD DE ALCALÁ	**Escuela Politécnica Superior** **Departamento de Teoría de la Señal y Comunicaciones** **Grados TIC**
	Subject: Circuit Analysis - P.E.I. 1
	Course: 1st. Group: E | **Grupo Pequeño: -**
	Surnames:
	Name:
	D.N.I.:
	Date: 1 – March – 2017

Instructions

- **Fill in all the data required in the first page.**
- The exam consists on 3 problems. Check that you have all of them.
- The duration of the exam is 1 hours 30 minutes.
- Books or notes are not allowed.
- Read carefully each problem before starting to answer.
- It is compulsory to write your name on each sheet. Any sheet without a name will be **immediately** removed.
- Start a new page for each problem. Before delivering the exam sort the pages.
- **SWITCH OFF AND KEEP AWAY THE MOBILE PHONE.**
- The grading of the exam will take into account the following aspects:
  1. Clean and ordered responses.
  2. **Explanation and reasoning in accordance to the studied theory.**
  3. **Explanations of each performed step in a resolution.**
  4. Simplicity and efficiency of the adopted solution.
  5. The obtained results.

PROBLEM 1 (2.5 points)

Perform the association between the circuits shown in figure 1 and the respective transient responses of the voltage $v_{AB}(t)$ shown in figure 2. **REASON** why do you do these associations.

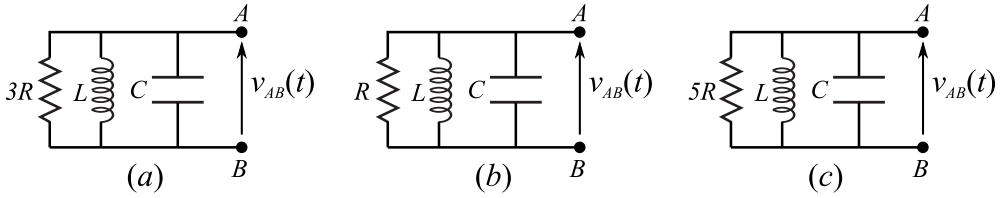

Figura 1

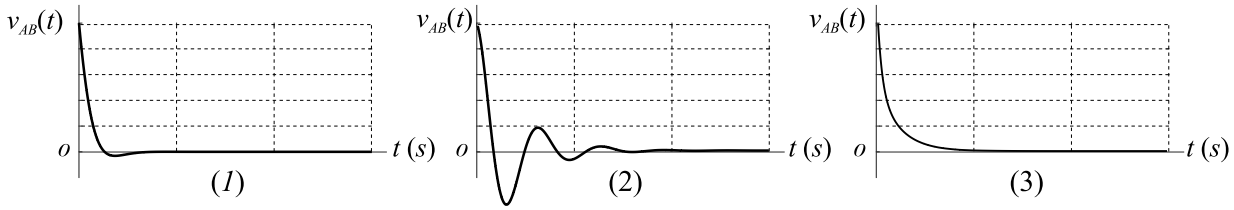

Figura 2

PROBLEM 2 (2.5 points)

In the circuit of the figure 1, the switcher is in position (1) since $t = -\infty$. At $t = 0$ s, it switches to position (2) staying in this position for the rest of the time. It is known that the circuit is a RC-circuit made of only one R and one C, and that the voltage at the circuits terminals for $t > 0$ is:

$$v(t) = 5 \left(1 - e^{-\frac{t}{2}}\right)$$

Determine the internal structure of the RC-circuit and the values of their elements.

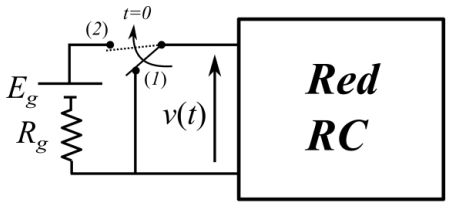

Figura 1

DATA:

$$E_g = 10\text{V} \quad ; \quad R_g = 5\ \Omega$$

PROBLEM 3 (5 points)

In the circuit of the figure 1, the switcher is in position (1) since $t = -\infty$. At $t = 0$ s, it switches to position (2) staying in this position for the rest of the time. Calculate:

a) Initial conditions at the switching time.

b) Obtain the time evolution of the current $i_L(t)$ for $t > 0$ s.

c) Calculate the value of **R** so that the circuit has a critical transient response.

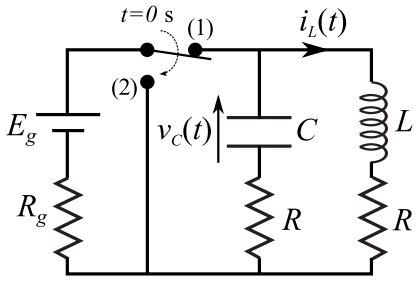

Figura 1

DATA:

$$E_g = 4\text{V} \;\; ; \;\; R_g = R = 2\ \Omega \;\; ; \;\; L = 2\ \text{H} \;\; ; \;\; C = \frac{1}{8}\ \text{F}$$