UNIVERSIDAD DE ALCALÁ	**Escuela Politécnica Superior** **Departamento de Teoría de la Señal y Comunicaciones** **Grados TIC**
	Asignatura: Análisis de Circuitos - P.E.I. 1
	Curso: 1º. Grupo Grande: E | **Grupo Pequeño:**
	Surnames:
	Name:
	D.N.I.:
	Date: 7 – March – 2018

Instructions

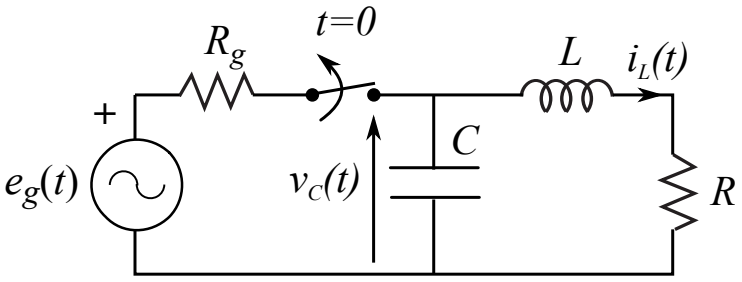
- **Fill in all the data required in the first page.**
- The exam consists on 2 problems and one test with 5 questions. Check that you have all of them.
- The duration of the exam is 1 hour 30 minutes.
- Books or notes are not allowed.
- Read carefully each problem before starting to answer. The grading of each exercise is indicated.
- It is compulsory to write your name on each sheet. Any sheet without a name will be **immediately** removed.
- **Start each problem in a new page.**
- **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 factors:
  1. Clean and ordered responses.
  2. **Explanation and reasoning in accordance to the studied theory.**
  3. **Explanations of each adopted step in a resolution.**
  4. Simplicity and efficiency of the adopted solution.
  5. The obtained results.

Problem 1 (3 points)

In the circuit of the figure, the switcher is closed since $t = -\infty$, and is opened at $t = 0$ s. While the switcher is closed, the temporal expressions for the current trough the coil and the voltage at the capacitor are, respectively, $i_L(t) = \frac{1}{2} \cdot \cos(\omega t)$ A and $v_C(t) = 2\sqrt{2} \cdot \cos\left(\omega t + \frac{\pi}{4}\right)$ V. Otain:

a) The expression for the Laplace transform of the current trough the coil, $I_L(s)$, for $t > 0$ as a function of L and C.

b) The values of L and C to have a critically damped solution, knowing that the natural frequency is $\sqrt{2}$ rad/s.



Data:

$e_g(t) = E_0 \cos(\omega t + \phi)$ V

$R = 4\ \Omega$

Problem 2 (2 points)

In the circuit of the figure, the switcher is in position (1) since $t = -\infty$. At $t = 0$ s the switcher changes to the position (2), producing the following time evolution of the current trough the coil, $i_L(t)$:

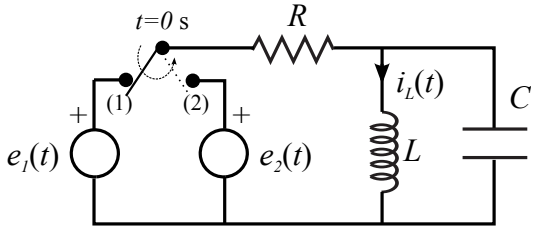
$$i_L(t) = k_1 \cdot e^{-\frac{t}{2}} + k_2 \cdot e^{-\frac{11}{2}t} + 40 \ \text{ A} \quad t > 0$$

being k_1 and k_2 real constants.

a) Indicate, in a reasoning way, the type of damping of the circuit.

b) Knowing that the current through the coil at $t = 0^+$ is 10 A, obtain the values of R, L and C.

c) Obtain the expression of $e_2(t)$



DATA :

$e_1(t) = 5$ V