King Fahd University of Petroleum & Minerals
Department of Electrical Engineering

EE205 Electrical Circuits II

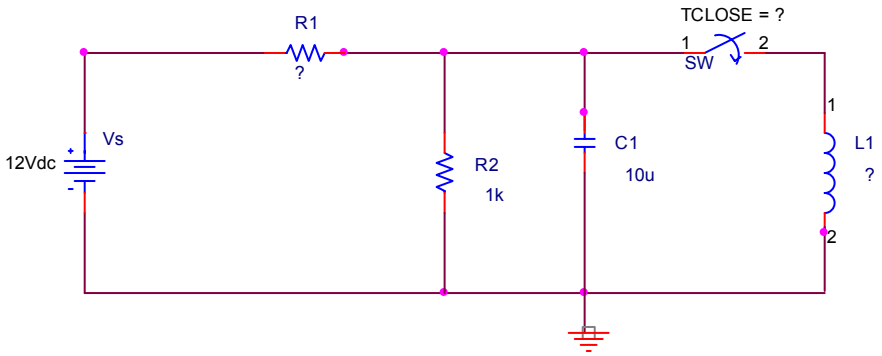
Project I: Transient Response of Second Order RLC Circuits

Due: Mon., November 10, 2003

For the following circuit, the switch closes after the capacitor is about fully charged. Assume that all initial (t=0) conditions are zero

1. Design the value of R1 to achieve a full charge of 10V across the capacitor.
2. Establish full charge to the capacitor and then close the switch. Calculate the time t_0, at which the switch SW will be closed.
3. Design the value of L1 in which the inductor current is required to reach its final value as fast as possible. Maximum allowed overshoot is 20% of the final value. How long does it take the inductor current (i_L) to reach to it is final value?
4. In addition to your hand analysis, verify step 1 step 2, and step 3 using Pspice software package. Show all responses relating to the calculation above. Label all necessary information on the responses. Plot the voltage and the currents

$$v_C(t), i_C(t), i_L(t), i_R(t)$$



Specifications: V_S = 12V dc, R_1 = ? Ω, R_2 = 1kΩ, C_1 = 10 μF, and L_1 = ?

Hints:

1. Initialize the value of the capacitor to zero before you start the simulation. In Pspice you can skip the initial transient bias point calculation.

2. You might need to iterate between hand analysis and Pspice to find the best design value for L1.

3. Writing style and organization are very important (Quality not Quantity!)

Good luck
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