Homework 4

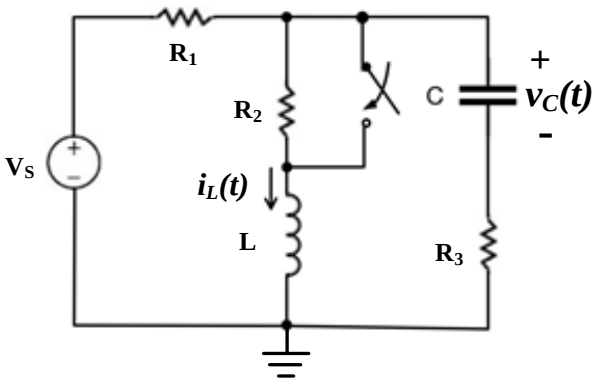
Due date: 8th, NOV.

Turn in your homework in class

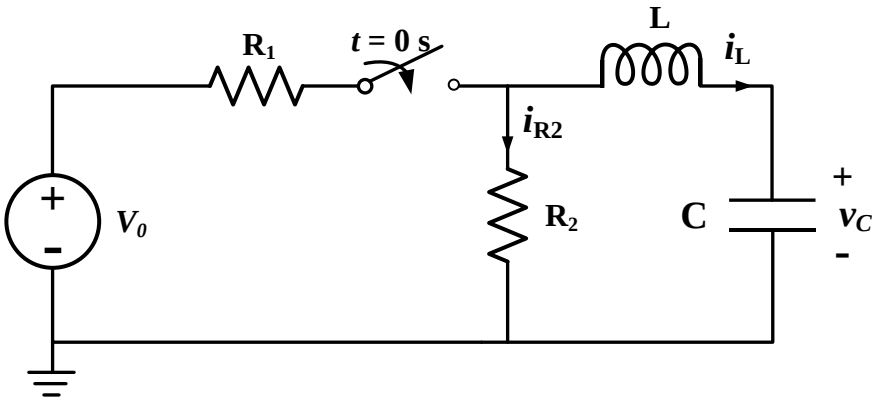
Rules:

- Work on your own. Discussion is permissible, but extremely similar submissions will be judged as plagiarism.
- Please show all intermediate steps: a correct solution without an explanation will get zero credit.
- Please submit on time. No late submission will be accepted.
- Please prepare your submission in English only. No Chinese submission will be accepted.

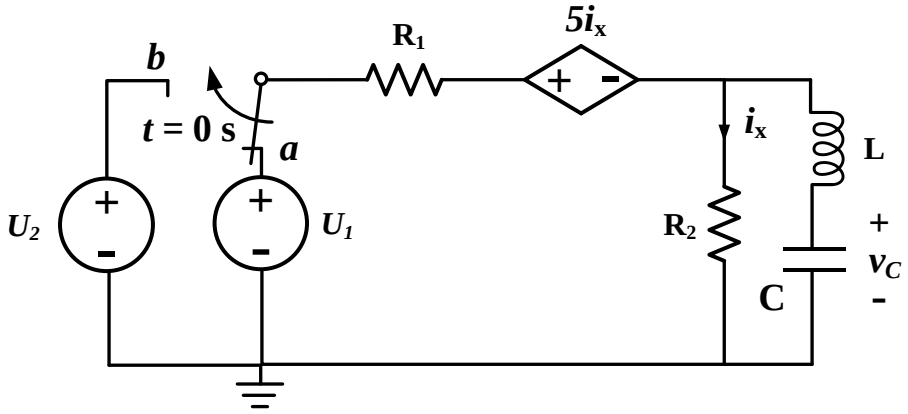
1. For the circuit below, the switch has been open for a long time. The switch is closed at $t = 0$s immediately. Given $\mathbf{V_S} = 10$V, $\mathbf{R_1} = 2\Omega$, $\mathbf{R_2} = 3\Omega$, $\mathbf{R_3} = 1\Omega$, $\mathbf{L} = 4$H, $\mathbf{C} = 2$F, please find $v_C(0^+)$, $dv_C(0^+)/dt$, $i_L(0^+)$, $di_L(0^+)/dt$. (Hint: remember to assign units for your answers)



2. Determine $v_c(t)$, $i_L(t)$, and $i_{R2}(t)$ in the circuit for $t \geq 0$, given that $V_0 = 12V$, $R_1 = 2\ \Omega$, $R_2 = 2\ \Omega$, $L = 0.25$ H and $C = 0.5$ F. Note that the switch has been open for a long time before $t = 0$s

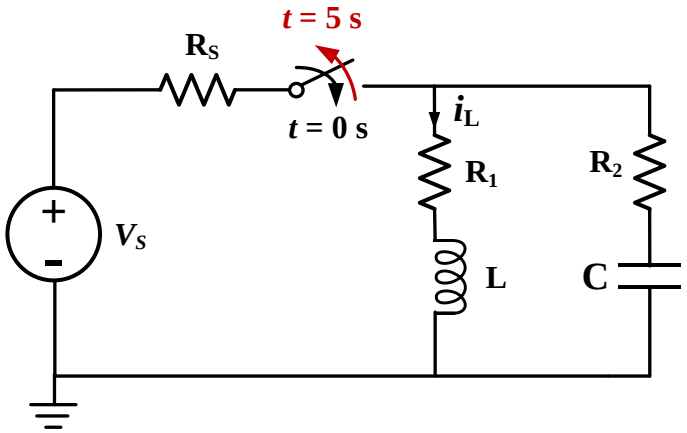


3. In the circuit below, R_1= 10Ω , R_2= 5Ω , L = 4mH , C = 10mF, U_1 =5V, and U_2 =12V. When t = 0s, the switch changes from node a to node b immediately. Assume that the circuit reaches steady state before t = 0. Determine the expression for $v_C(t)$ and i_x(t) when $t \geq$ 0s.



4. In the following circuit, the switch was closed at t = 0s and re-opened at t = 0.5s. Determine the response $i_L(t)$ for $t \geq 0$, and there's no energy stored in the inductor and capacitor before t = 0s.

   Assume that V_S = 18V, R_S =1Ω, R_1=5Ω, R_2=2Ω, **L**= 2H and **C**=$\frac{1}{17}$F.



5. For the following circuit, $R_1 = 1\Omega$, $R_2 = 2\Omega$, $C_1 = 3F$, $C_2 = 2F$, $V_0 = 20V$, and the coefficient $\alpha = 1$. The switch closes at $t = 0s$ immediately. Please find the voltage on the capacitors $v_{C1}(t)$ and $v_{C2}(t)$ for $t > 0s$, respectively. Note that the switch has been open for a long time before $t = 0s$.