ENGR 2910-101: Circuit Analysis

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Midterm 2

Question 1 [25]
Short Answer Responses:

1. State Ohm's Law in words

2. What is the equation for Ohm's Law

3. State Kirchhoff's Current Law (KCL) in words

4. What is the equation for KCL?

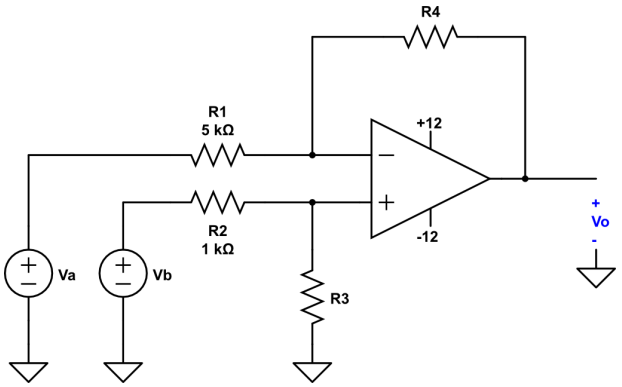
5. State Kirchhoff's Voltage Law (KVL) in words

6. What is the equation for KVL?

7. What are the three Ideal Op Amp assumptions (in words)

8. What two equations from these assumptions allow us to analyze an Ideal Op Amp?

Question 2 [25]



(a) For the differntial amplifier shown above, find values for R_3 and R_4 that amplify the difference between the V_a and V_b by 4.

(b) If $V_a = 4V$, find the range for V_b that keeps the amplifier in the linear operating region.

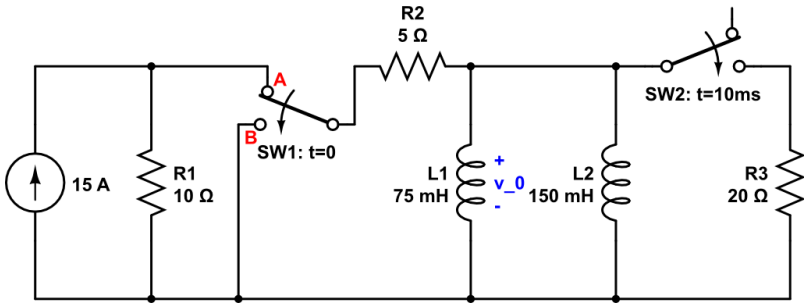
(c) If the R_1 resistor is reduced to $4k\Omega$ and all other values remain the same, that is the new range for V_b that keeps the amplifier in the linear operating region.

(d) What is the A_{dm}, A_{cm}, and CMRR for the amplifier with the resistor values from (c)?

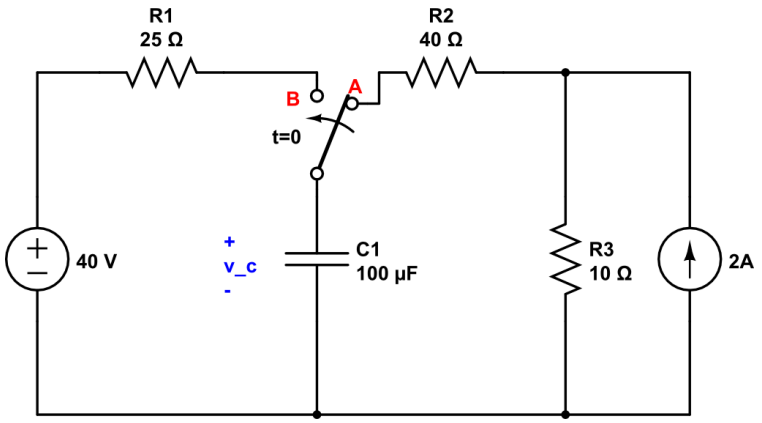
Question 3 [25]
In the circuit below, for $t < 0$ SW1 is in the A Position and SW2 is open. At $t = 0$, SW1 moves to Position B. Then, at $t = 10ms$, SW2 closes.

(a) Find v_0 (the voltage across L_1) at $t = 20ms$.

(b) How much energy is stored in L_2 at $t = 20ms$?



Question 4 [25]
For the below circuit has been in position a for a long time.



(a) At $t = 0$, the switch instantly moves to position b and stays there. Find:

(i) The initial and final values for the capacitor voltage

(ii) The time constant

(iii) The expression for the capacitor voltage for $t \geq 0$.

(b) At $t = 5ms$ the switch moves back to position a. Find:

(i) The initial and final values for the capacitor voltage

(ii) The time constant

(iii) The expression for the capacitor voltage for $t \geq 5ms$.