ENGR 2910-101: Circuit Analysis

Instructor: Brian Rashap

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

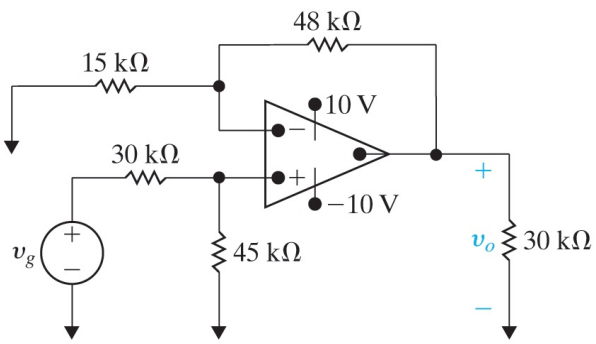
6. What is the equation for KVL?

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]

Assuming the Op Amp in the circuit below is ideal:



(a) What type of Op Amp circuit is this?

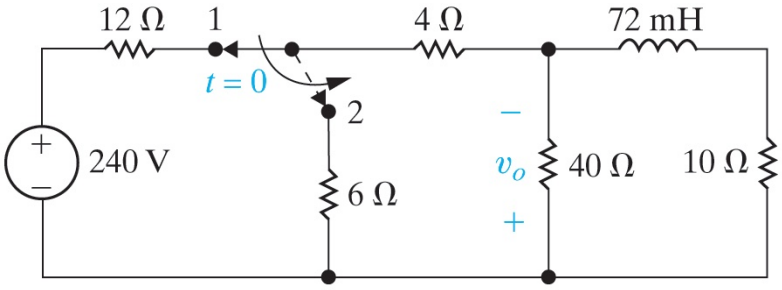
(b) Calculate v_0 when $v_g = 3V$.

(c) Specify the range of v_g where the Op Amp operates in the linear region

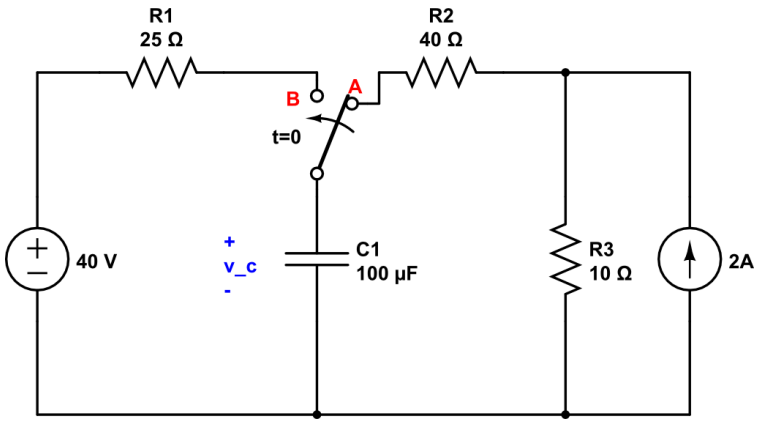
(d) Assume that v_g is set to $5V$ and that the 48Ω resistor is replaced with a variable resistor. At what value for the variable resistor with the Op Amp first saturate.

Question 3 [25]

The switch in the circuit below has been in Position 1 for a long time. At $t = 0$, the switch moves instantaneously to Position 2. Find $v_0(t)$ for $t \geq 0^+$.



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 $t \geq 5ms$.