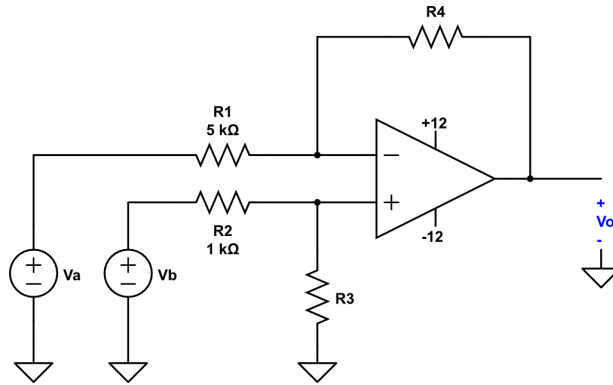


Question 1 [25]

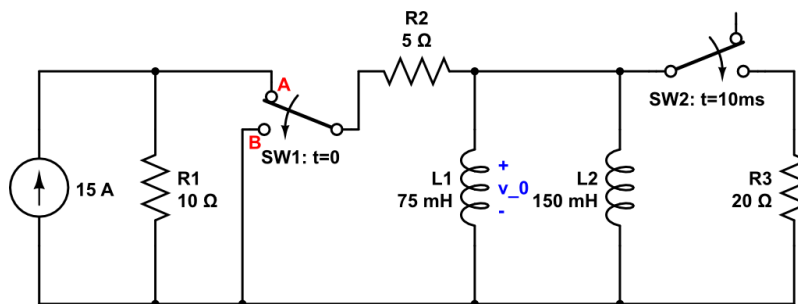


- For the differential amplifier shown above, find values for R_3 and R_4 that amplify the difference between the V_a and V_b by 4.
- If $V_a = 4V$, find the range for V_b that keeps the amplifier in the linear operating region.
- If the R_1 resistor is reduced to $4k\Omega$ and all other values remain the same, that is the new range for V_b that keeps the amplifier in the linear operating region.
- What is the A_{dm} , A_{cm} , and CMRR for the amplifier with the resistor values from (c)?

Question 2 [25]

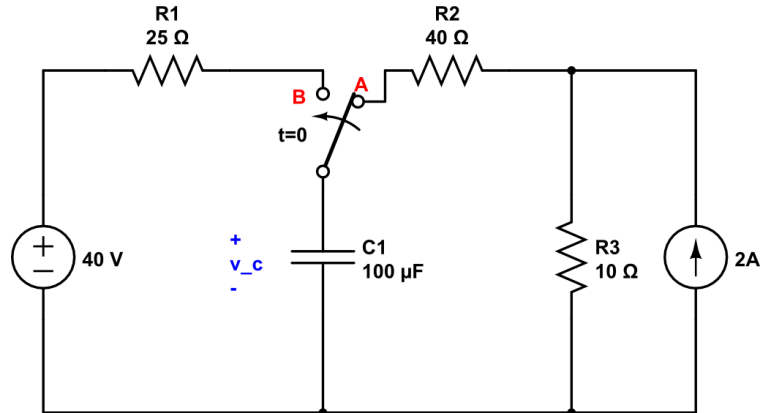
In the circuit below, for $t < 0$ SW1 is in the A Position and SW2 is open. At $t = 0$, SW1 moves to Position B. Then, at $t = 10ms$, SW2 closes.

- Find v_0 (the voltage across L_1 at $t = 20ms$).
- How much energy is stored in L_2 at $t = 20ms$?



Question 3 [25]

For the below circuit has been in position a for a long time.



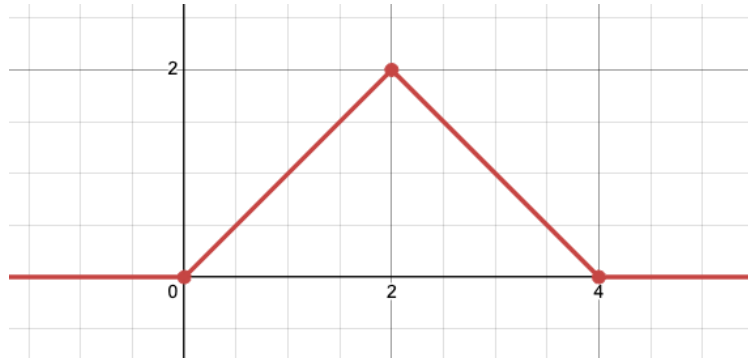
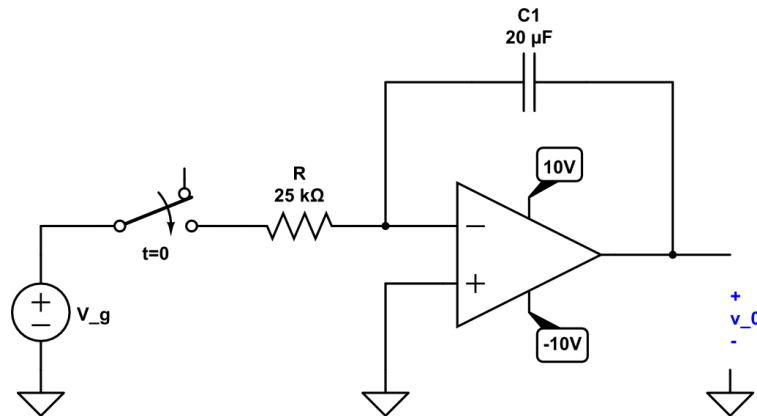
(a) At $t = 0$, the switch instantly moves to position b and stays there. Find:

- (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 $t \geq 5ms$.

Question 4 [25]



- Find a numerical expression for V_g for $0s \leq t \leq 2s$ and $2s \leq t \leq 4s$
- Derive the numerical expression for $v_o(t)$ for $0s \leq t \leq 2s$ and $2s \leq t \leq 4s$
- Sketch the output waveform between $0s$ and $4s$.
- Now consider a waveform with a peak at $4V$ rather than $2V$, sketch the resulting waveform.