HW 5

Posted Monday March 5th

Due Monday March 12th

EE40

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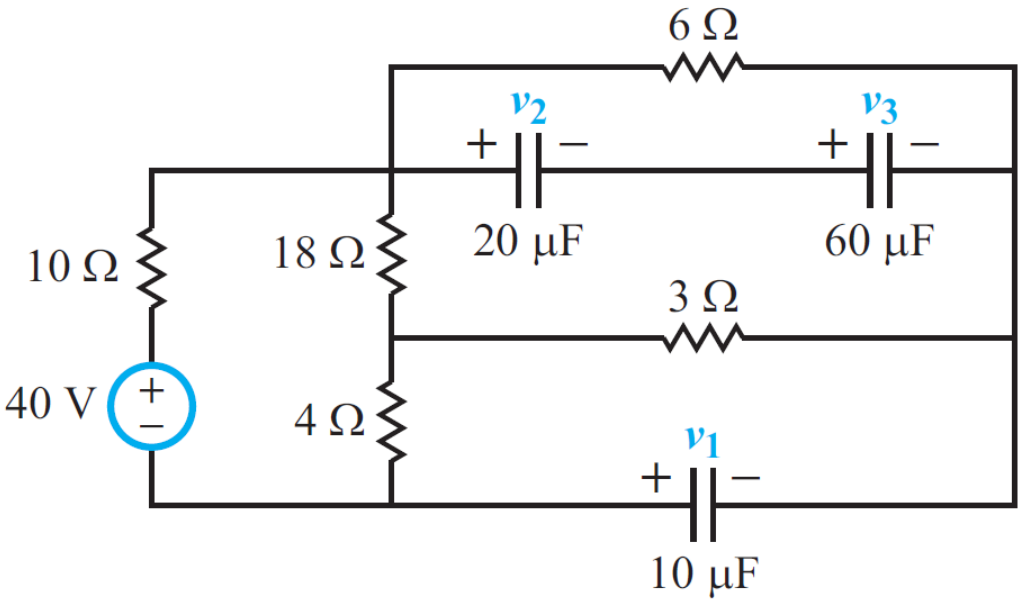
1. After opening a certain switch at t = 0 in a circuit containing a capacitor, the voltage across the capacitor started decaying exponentially with time. Measurements indicate that the voltage was 7.28 V at t = 1 s and 0.6 V at t = 6 s. Determine the initial voltage at t = 0 and the time constant of the voltage waveform.

2. The current through a 40 mF capacitor is given by a rectangular pulse as

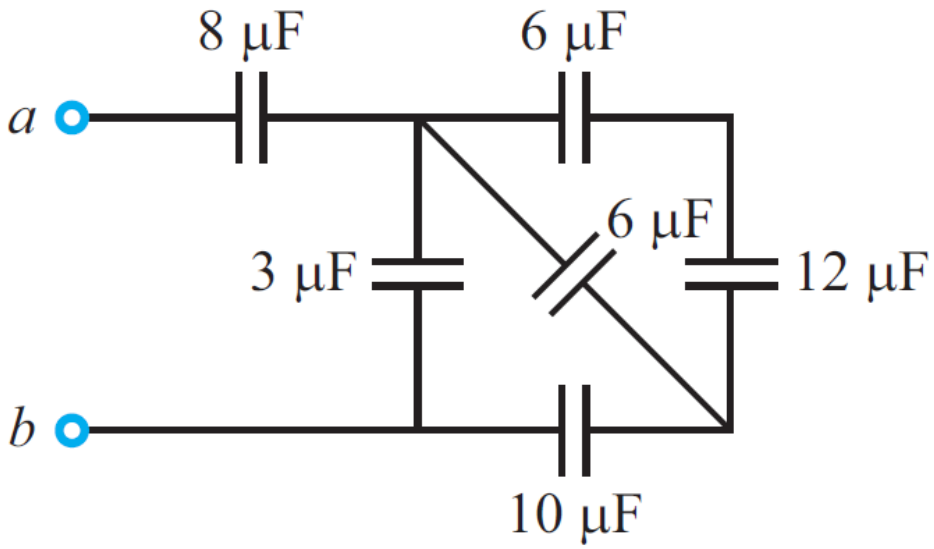
$$i(t) = 40\text{rect}\left(\frac{t-1}{2}\right)\ \text{mA}$$

If the capacitor was initially uncharged, determine $v(t)$, $p(t)$, and $w(t)$.

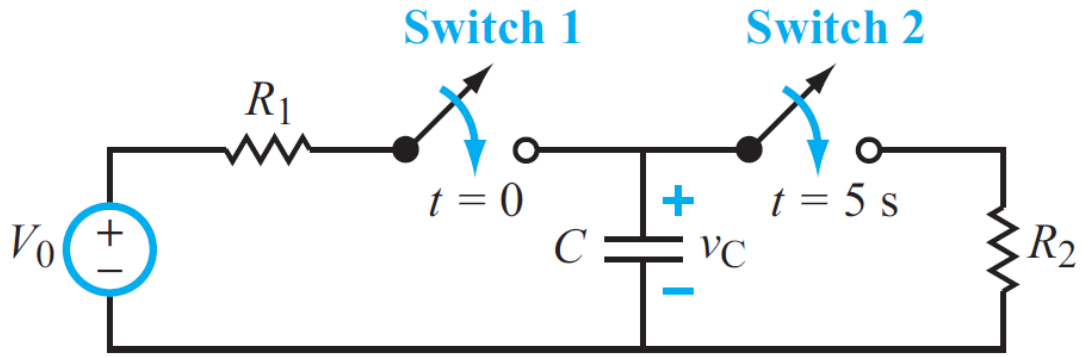
3. Determine voltages $v1$ to $v3$ in the circuit below under dc conditions.



4. Assume that a 120 V dc source is connected at terminals (a,b) to the circuit below. Determine the voltages across all capacitors.

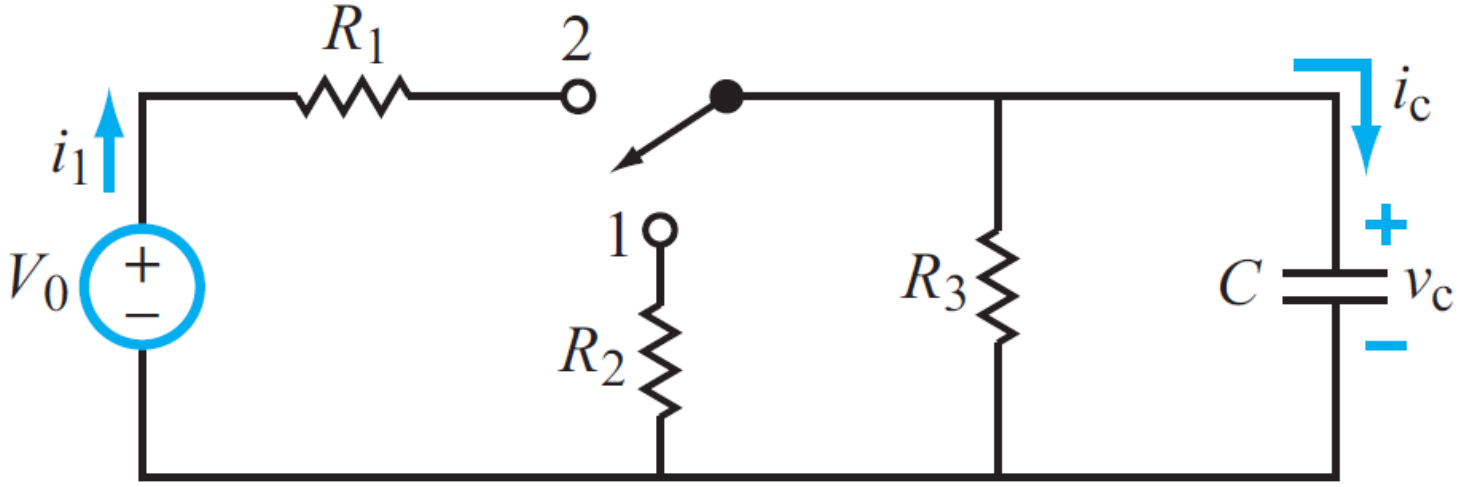


5. The circuit in the figure below contains two switches, both of which had been open for a long time before t = 0. Switch 1 closes at t = 0, and switch 2 follows suit at t = 5 s. Determine and plot $v_C(t)$ for $t \geq 0$ given that V_0 = 24 V, R1 = R2 = 16 kΩ, and C = 250 mF. Assume $v_C(0) = 0$.

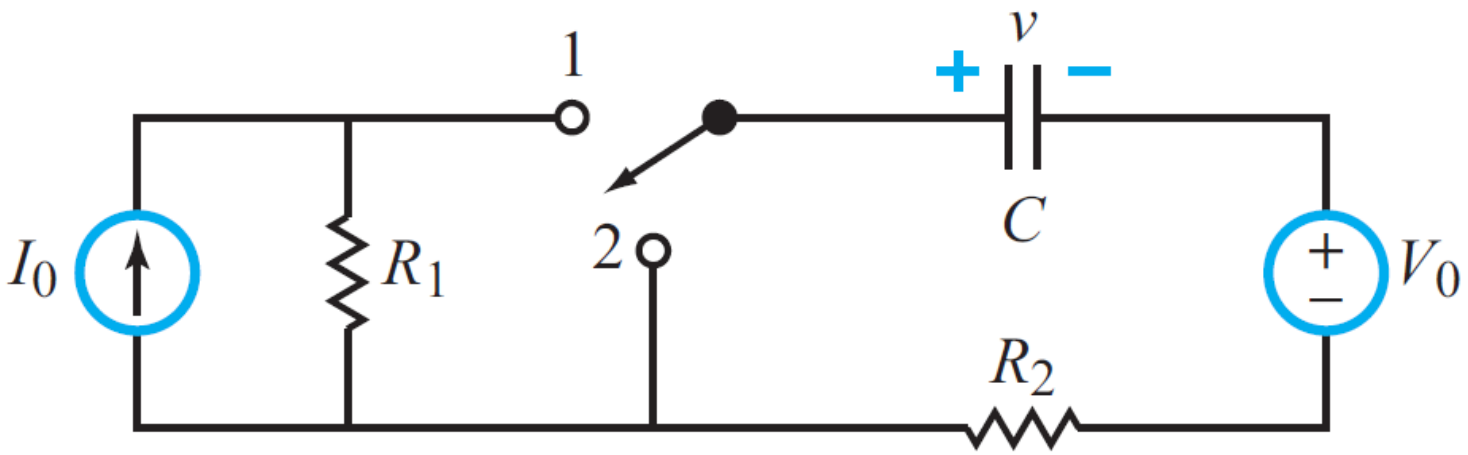


6. After having been in position 1 for a long time, the switch in the circuit below was moved to position 2 at t = 0. Given that V0 = 12 V, R1 = 30 kΩ, R2 = 120 kΩ, R3 = 60 kΩ, and C = 100 μF, determine:

(a) $i_C(0-)$ and $v_C(0-)$
(b) $i_C(0)$ and $v_C(0)$
(c) $i_C(\infty)$ and $v_C(\infty)$
(d) $v_C(t)$ for $t \geq 0$
(e) $i_C(t)$ for $t \geq 0$



7. The switch in the circuit below had been in position 1 for a long time until it was moved to position 2 at t = 0. Determine v(t) for $t \geq 0$, given that I0 = 6 mA, V0 = 18 V, R1 = R2 = 4 kΩ, and C = 200 μF.



8. For the circuit below, determine $i_L(t)$ and plot it as a function of t for $t \geq 0$. The element values are $I_0 = 4$ A, $R_1 = 6\Omega$, R2 = 12 Ω, and L = 2 H. Assume that $i_L = 0$ before t = 0.