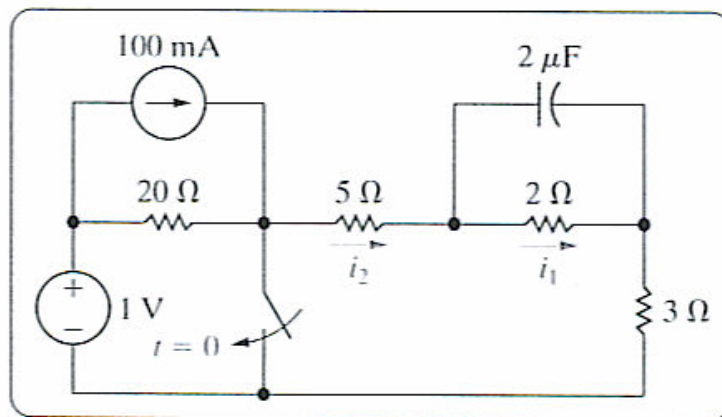


KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
ELECTRICAL ENGINEERING DEPARTMENT
EE-201 ELECTRIC CIRCUITS
Dr. Ibrahim O. Habiballah

Sec: 9 Quiz # 5 Ser. # Name:

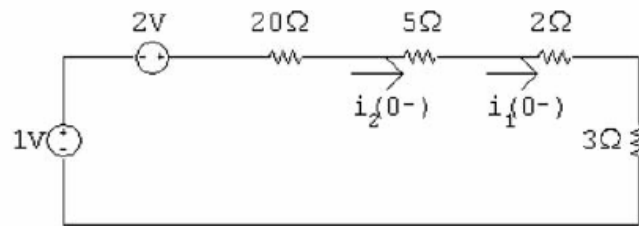
I.D.#

Find $i_1(t)$ and $i_2(t)$ in the circuit shown below.



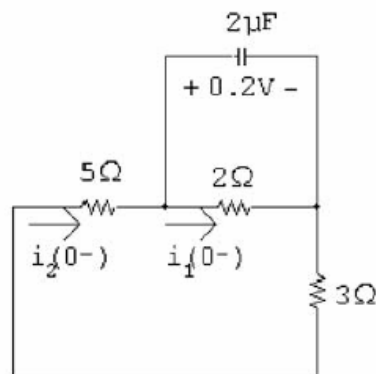
Solution

[a] $t < 0$:



$$i_1(0^-) = i_2(0^-) = \frac{3\text{ V}}{30\ \Omega} = 100\text{ mA}$$

[b] $t > 0$:



$$i_1(0^+) = \frac{0.2}{2} = 100\text{ mA}$$

$$i_2(0^+) = \frac{-0.2}{8} = -25\text{ mA}$$

[c] Capacitor voltage cannot change instantaneously, therefore,

$$i_1(0^-) = i_1(0^+) = 100\text{ mA}$$

[d] Switching can cause an instantaneous change in the current in a resistive branch. In this circuit

$$i_2(0^-) = 100\text{ mA} \quad \text{and} \quad i_2(0^+) = -25\text{ mA}$$

[e] $v_c = 0.2e^{-t/\tau}\text{ V}, \quad t \geq 0 \quad R_e = 2 \parallel (5 + 3) = 1.6\ \Omega$

$$\tau = 1.6(2 \times 10^{-6}) = 3.2 \times 10^{-6}\text{ s}$$

$$v_c = 0.2e^{-312,500t}\text{ V}, \quad t \geq 0$$

$$i_1 = \frac{v_c}{2} = 0.1e^{-312,500t}\text{ A}, \quad t \geq 0$$

[f] $i_2 = \frac{-v_c}{8} = -25e^{-312,500t}\text{ mA}, \quad t \geq 0^+$