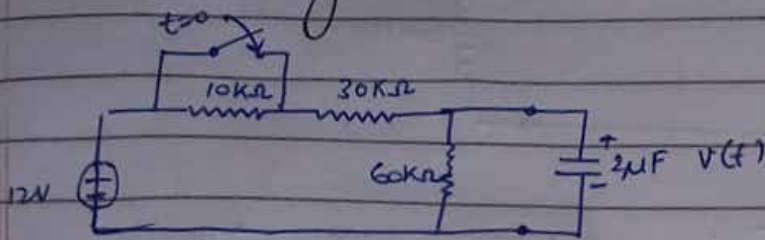
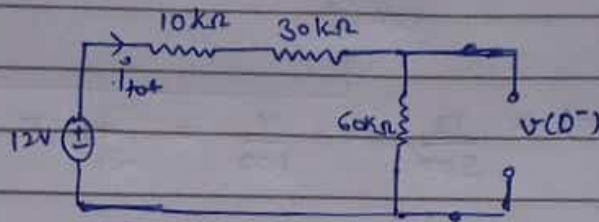


Assignment

Q3.

for  $t = 0^-$ 

$$i_{tot} = \frac{12}{100k\Omega}$$

$$V(0^-) = \frac{60 \times 12}{100} = \frac{72}{10} = 7.2V$$

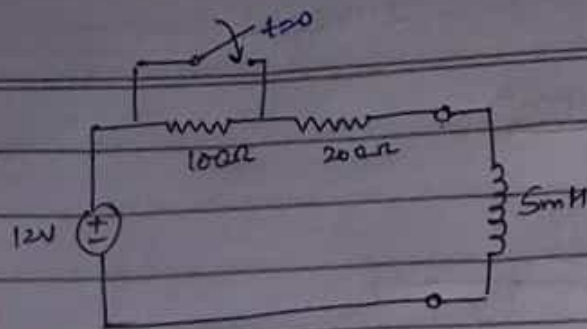
for  $t > 0$ 

$$V_c(\infty) = \frac{12 \times 2}{30 + 60} = 8V$$

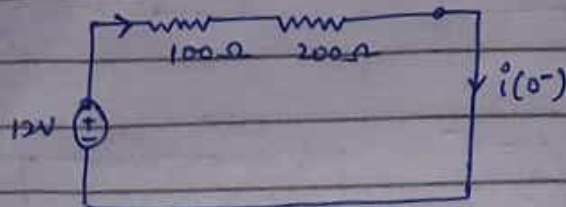
$$\tau = R_t C = \frac{30 \times 60}{30 + 60} \times 10^3 \times 2 \times 10^{-6} = 20 \times 10^3 \times 2 \times 10^{-6} = 40 \times 10^{-3}$$

$$\begin{aligned} V_c(t) &= 8 - (8 - 7.2) \times e^{-t/\tau} \\ &= 8 - (0.8) e^{-t/40 \times 10^{-3}} = 8 - 0.8 e^{-\frac{1000t}{40}} \text{ Volt} \\ &= 8 - 0.8 e^{-25t} \text{ V} \end{aligned}$$

Q.4.

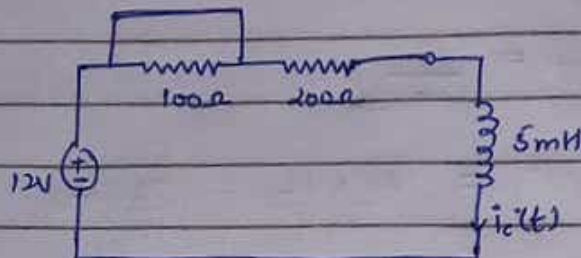


for  $t = 0^-$ :



$$i(0^-) = \frac{12}{300} = \frac{4}{100} = \frac{1}{25} = 0.04 \text{ A}$$

for  $t > 0$ :



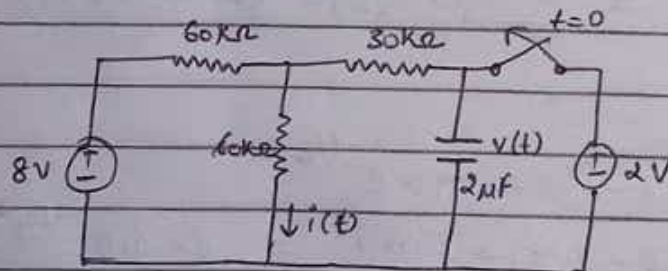
$$i_c(\infty) = \frac{12}{200} = 0.06 \text{ A}$$

$$\tau = \frac{L}{R_{th}} = \frac{5 \times 10^{-3}}{200} = \frac{10^{-4}}{4}$$

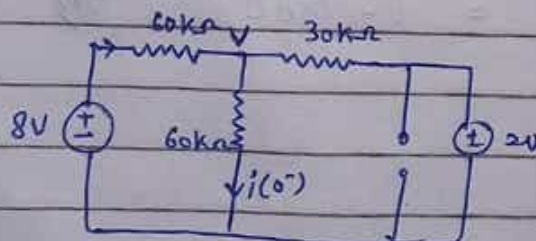
$$i_c(t) = 0.06 - (0.06 - 0.04) e^{-t/10^{-4}/4}$$

$$= 0.06 - 0.02 e^{-40000t} \text{ A}$$

Q.5.



for  $t = 0^-$ :



At node V

$$\frac{8-V}{60} = \frac{V}{60} + \frac{V-2}{30}$$

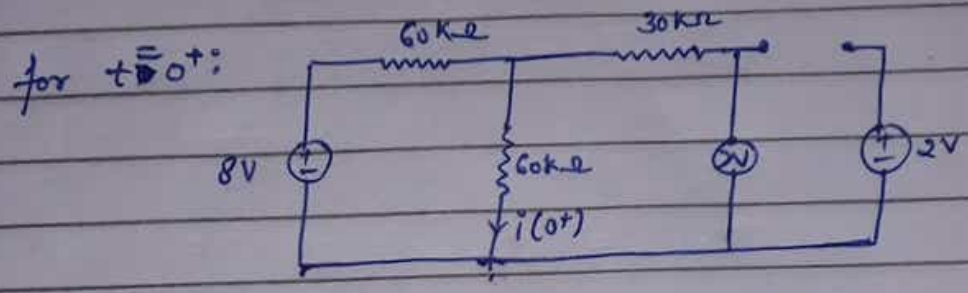
$$8-V = V + 2V - 4$$

$$8 = 4V - 4$$

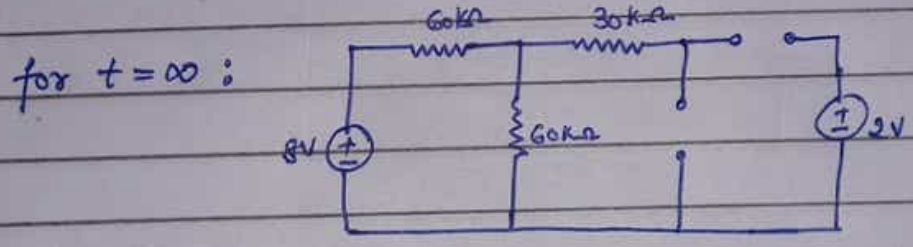
$$12 = 4V$$

$$V = 3V$$

$$i(0^-) = \frac{3}{\frac{60 \times 10^3}{20}} = \frac{1}{2 \times 10^4} = 0.05 \text{ mA}$$



$$i(0^+) = 0.05 \text{ mA}$$



$$i(\infty) = \frac{8}{120 \times 10^3} = \frac{1}{15 \times 1000} = 0.066 \text{ mA}$$

$$R_{th} = 60k \parallel 60k + 30k = 60k \Omega$$

$$\tau = R_{th} C = 60 \times 10^3 \times 2 \times 10^{-6} = 120 \times 10^{-3} = 0.12 \text{ s}$$

$$i_c(t) = 0.066 - (0.066 - 0.05) e^{-t/\tau}$$

$$= 0.066 - 0.016 e^{-t/120 \times 10^{-3}} = 0.066 - 0.016 e^{-\frac{1000}{12} t} \text{ mA}$$