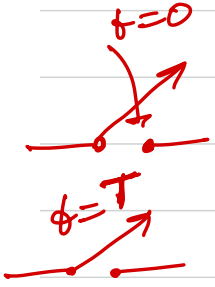
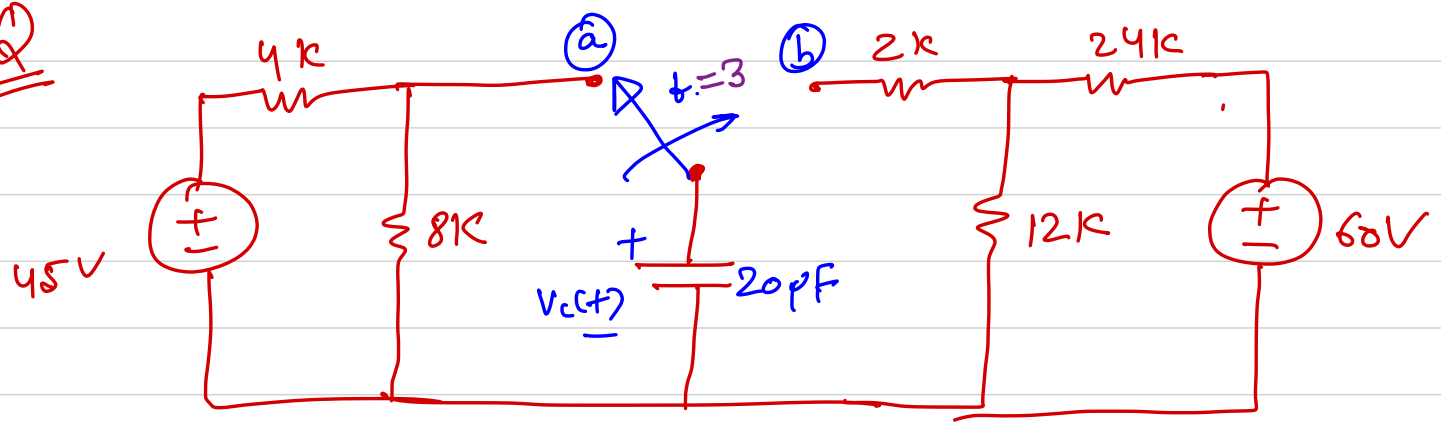
$$v_c(t) = \{ v_c(\infty) + (v_c(0) - v_c(\infty)) e^{-t/\tau} \quad " \quad " \quad t > 0 \}$$

$$= \left[v_c(\infty) + (v_c(0) - v_c(\infty)) e^{-t/\tau} \right] u(t)$$



$$\left[v_c(\infty) + (v_c(0) - v_c(\infty)) e^{-(t-T)/\tau} \right] u(t-T)$$

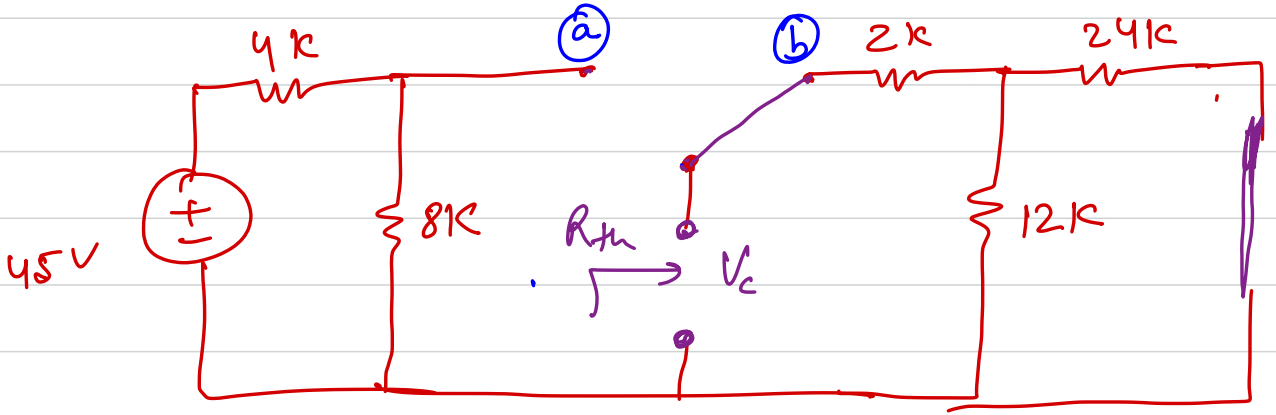
Q



$v_c(t) = 20 + 10e^{-5t} \quad t > 0 \;,\; \left[20 + 10e^{-5t}\right] u(t)$

$v_c(t) = v_c(\infty) + \left(v_c(0) - v_c(\infty)\right) e^{-t/\tau}$

$\tau = R_{th} C$



$R_{th} = (24K \| 12K) + 2K$

$= 16K\Omega$

$t = -\infty$ to 0^- $\Rightarrow$ $V_c(0-) = 30V = V_c(0+)$

$V_c(\infty) \Rightarrow t = 5\tau$ to ∞

$V_c(\infty) = 20V$

$R_{th} \rightarrow t = 5\tau$ to ∞, $t = -\infty$ to 0^-

$\tau = RC = 10K\Omega \times 20\mu F = 0.2$

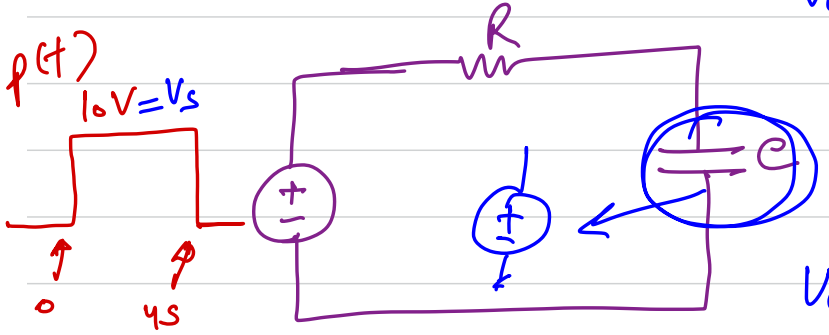
$$20 + (30-20)e^{-t/0.2} \quad t>0$$

$$v_c(t) \Rightarrow (20+10e^{-5t})u(t)$$

$$= 20+10e^{-5(t-3)}u(t-3)$$

$$v_c(t) = \begin{cases} 30 & 0<t<3 \\ 20+10e^{-5(t-3)} & t>3 \end{cases}$$

Q $v_c(t) \rightarrow$



$v_2(t) = -V_s\,u(t-4) \rightarrow -V_s\left(1-e^{-(t-T)/\tau}\right)u(t-T)$

$v_{c2}(t) = -10\left(1-e^{-(t-4)/RC}\right)u(t-4)$

$R = 25K \quad C = 0.2mF$

$v_c(t) = v_c(\infty) + \left(v_c(0) - v_c(\infty)\right)e^{-t/\tau}$

$v_{c1}(t) = V_s\left(1-e^{-t/\tau}\right) = 10\left(1-e^{-0.2t}\right)$

$p(t) = V_s\left[u(t) - u(t-4)\right] = V_s\,u(t) - V_s\,u(t-4)$

$v_1 \qquad v_2$

$V_s\,u(t) \quad v(0-) = 0 = v_c(0+)$

$= v_1 - v_2$

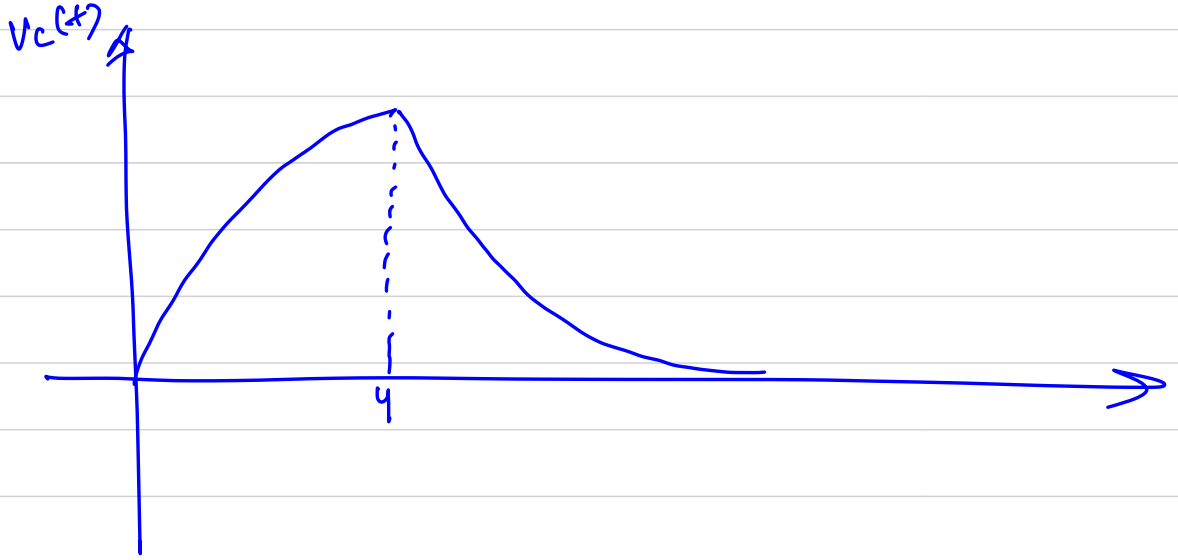
$v_c(\infty) = (10V) \qquad 25K \times 0.2mF$

$R_{th} = 25K$

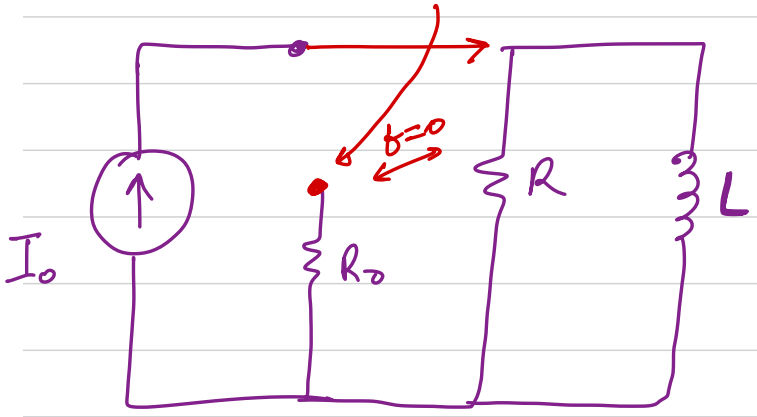
$v_{c1}(v_1) + v_{c1}(-v_2)$

$$v_c(t) = v_{c1}(t) + v_{c2}(t)$$

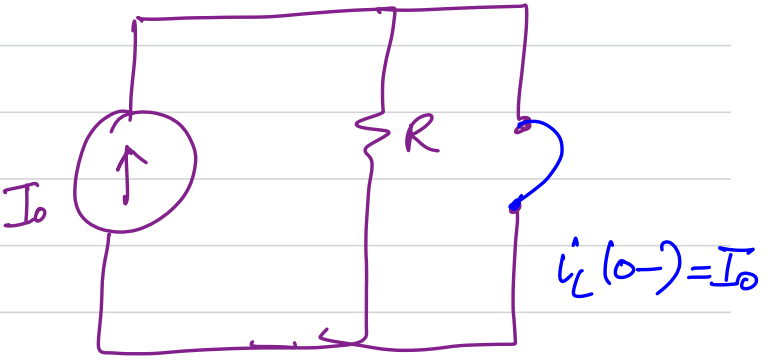
$$v_c(t) = 10\left(1 - e^{-0.2t}\right) - 10\left(1 - e^{-0.2(t-4)}\right)u(t-4),$$



R-L



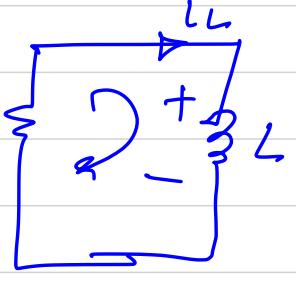
$t = -\infty$ to 0^-



$$i_L(0-) = i_L(0+) = I_0$$

$t > 0$

$$i_L R + L \frac{di_L}{dt} = 0$$

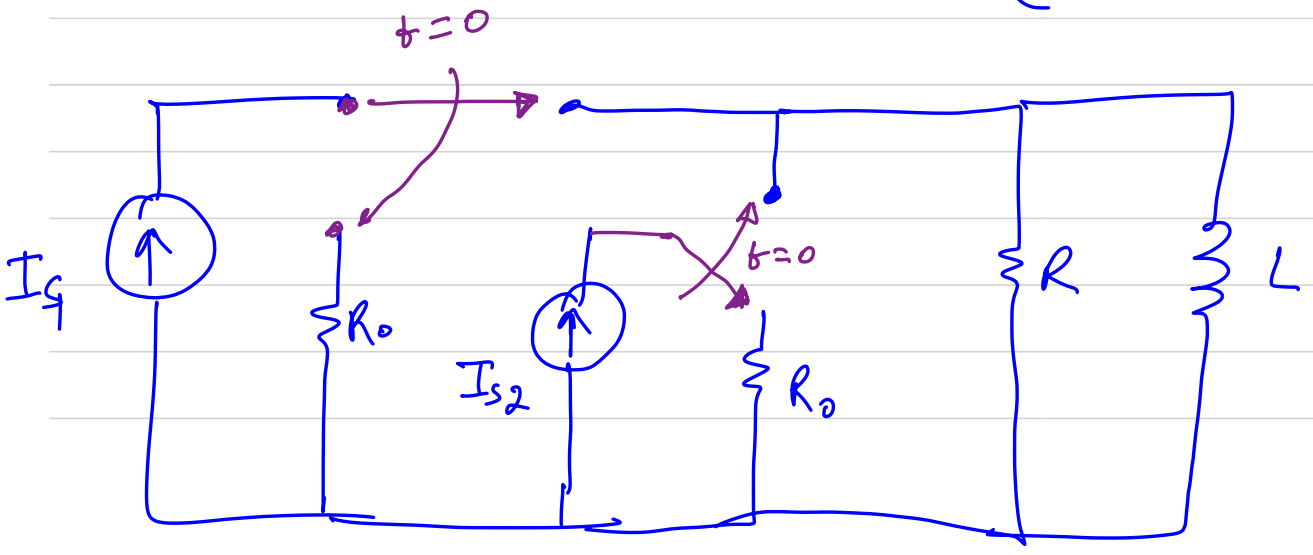


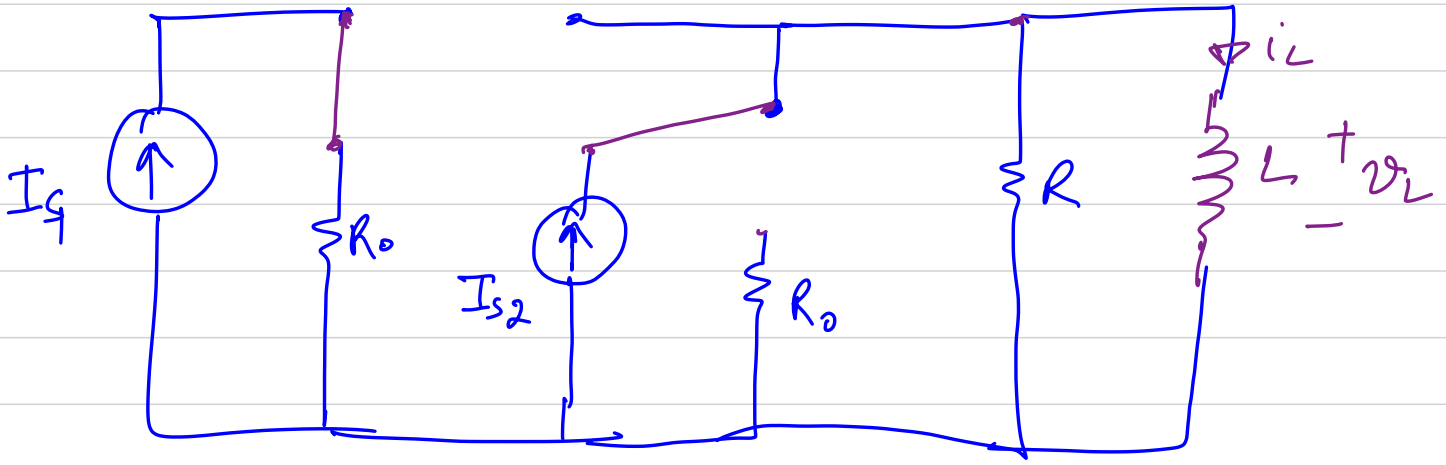
$$\frac{di_L}{dt} + \frac{R}{L} i_L = 0$$

$$\frac{di_L}{dt} + a\, i_L = 0 \longrightarrow$$

$$i_L(t) = i_L(0)\, e^{-t/\tau}\, u(t)$$

$$\left(\tau = \frac{L}{R} = \frac{1}{a}\right)$$





$t = -\infty$ to $0-$

$i_L(0-) = i_L(0+) = I_{S1}$

$v_L = L\frac{di}{dt}$

$\left(\frac{v_L}{R} + i_L = I_{S2}\right)$

$\left(\frac{L}{R}\frac{di}{dt} + i_L = I_{S2}\right)$

$$\frac{di_L}{dt} + \frac{R}{L} i_L = \frac{R}{L} I_{S2}$$

$$\frac{di_L}{dt} + a\, i_L = b$$

$a = R/L$, $\left(b = \frac{R}{L} I_{S2} = a\, I_{S2} \right)$

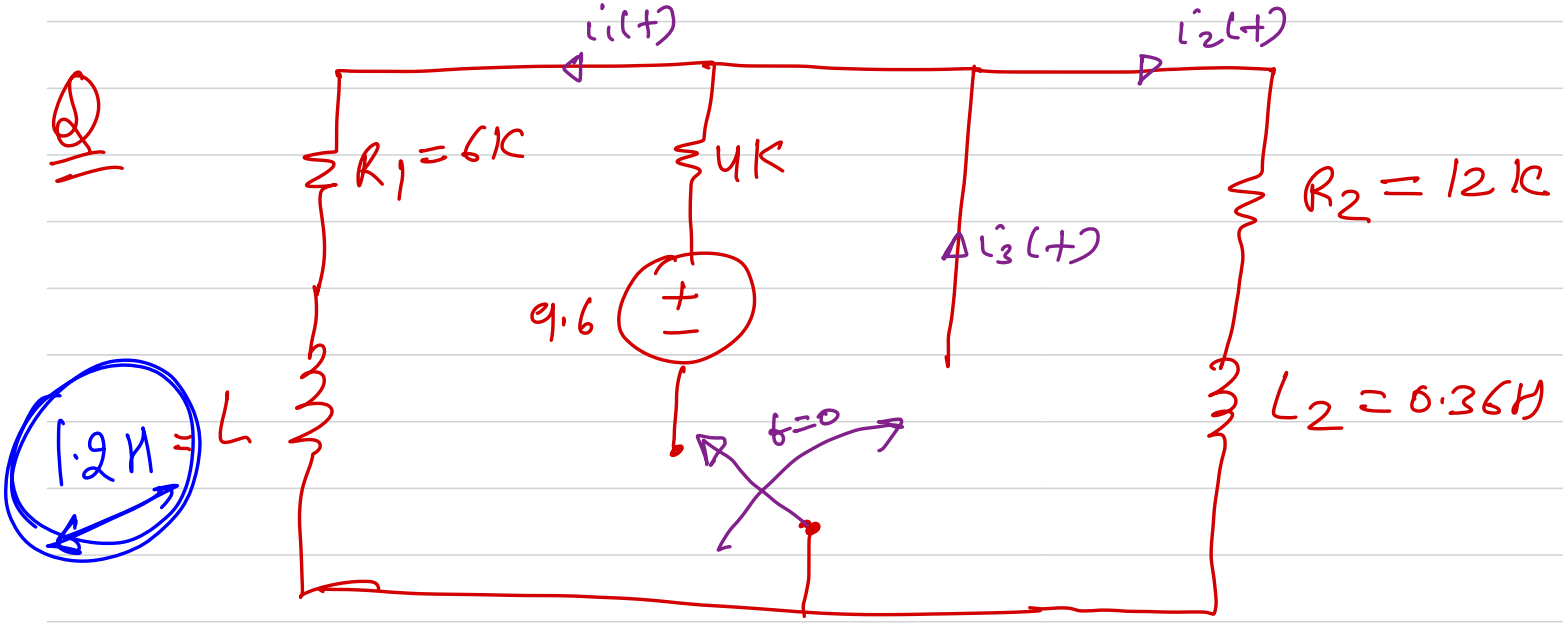
$$i_L(t) = i_L(\infty) + \left(i_L(0) - i_L(\infty) \right) e^{-t/\tau}\, u(t)$$

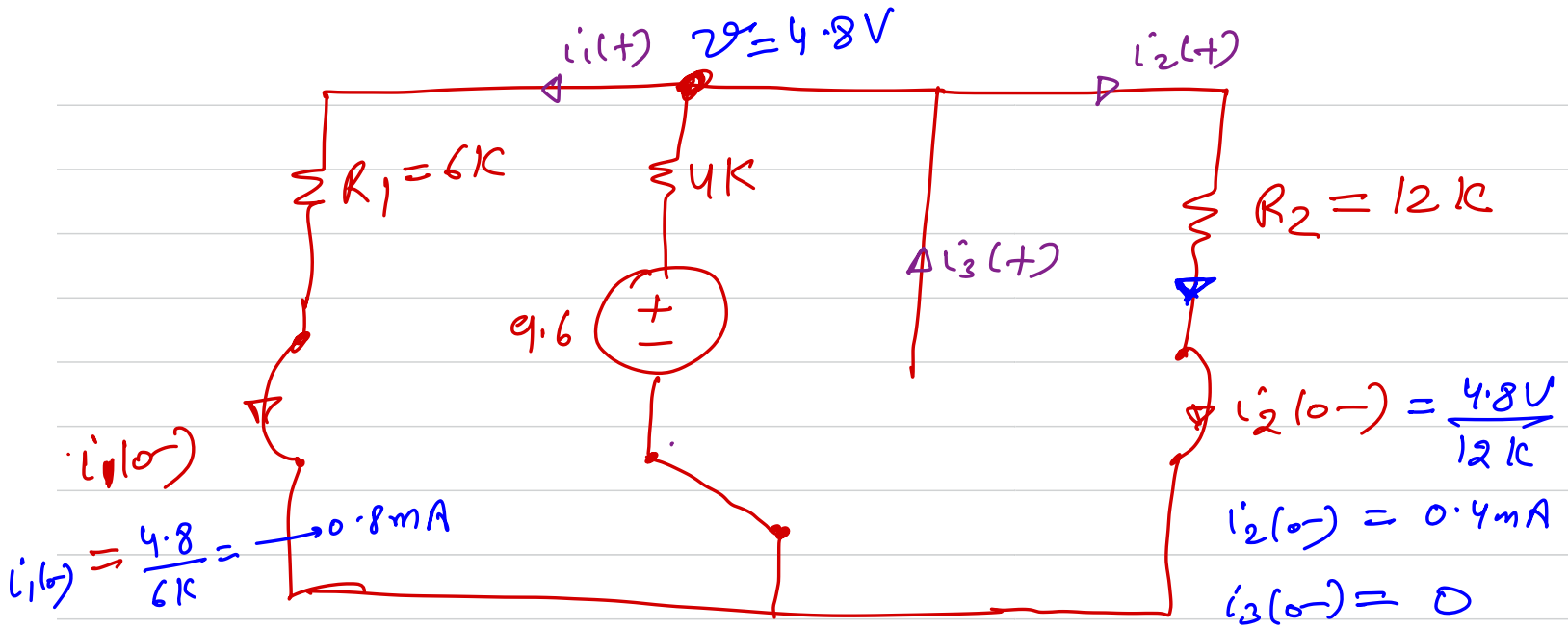
$i_L(0) = I_{S1}$ $\quad i_L(\infty) = I_{S2}$

$t = 0 \rightarrow t = \tau$

$$i_L(t) = i_L(\infty) + (i_L(0) - i_L(\infty))\, e^{-(t-T_0)/\tau}\, u(t-T_0)$$

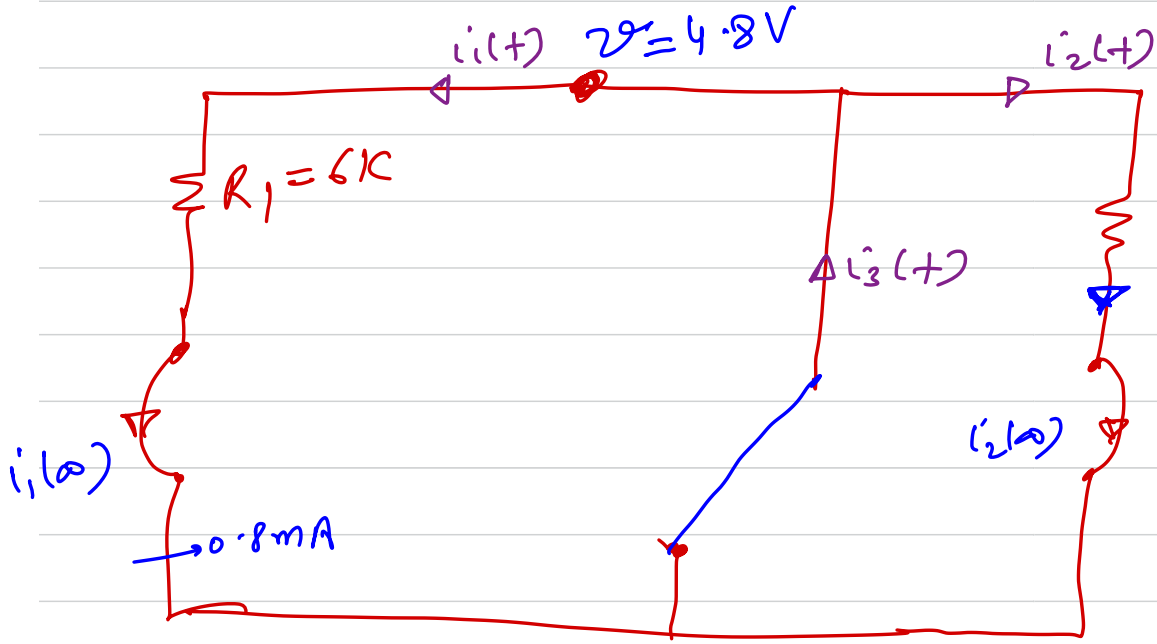
Q





$$v\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{4K}\right) - \frac{9.6}{4K} = 0 \Rightarrow v = 4.8V$$

$t = 5\tau$ to ∞



$i_1(\infty) = 0$ Amp

$i_2(\infty) = 0$ Amp

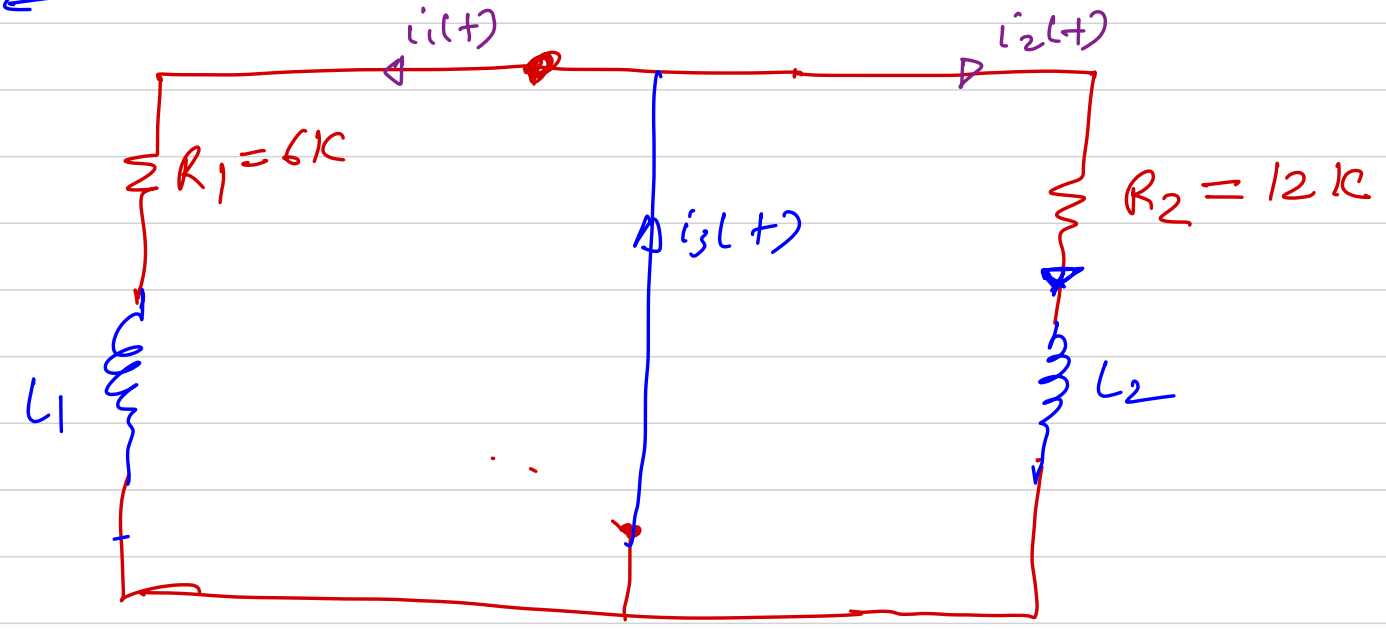
$i_1(t) = 0.4\, e^{-t/\tau_2}$

$i_2(t) = 0.8\, e^{-t/\tau_1}$

$i_3(t) = i_1(t) + i_2(t)$

$i_3(t) = 0.4\, e^{-t/\tau_2} + 0.8\, e^{-t/\tau_1}$

$t = 0^+$ to 5τ



R_{th_1} across $L_1 = 6K \Longrightarrow \tau_1 = L_1/R_{th_1} = 2\times10^{-4}$

R_{th} across $L_2 = 12K \Longrightarrow \tau_2 = (L_2/R_{th_2}) = 3\times10^{-5}$