

# Tutorial Sheet - 1

Q1.  $V_C(0^-) = 3V$  so  $V_C(0^+) = 3V$

$$i_{1\Omega}(0^+) = \frac{3}{1} = 3A$$

Q2.  $i_L(0^-) = 2A$  so  $i_L(0^+) = 2A$

$$V(0^+) = 2(20) = 40V$$

Q3.

$$8 \times \frac{20}{25} = \frac{32}{5} A$$

$$V_{30} = \frac{30 \times 32}{8} = 192V = V(0^-) = V(0^+)$$

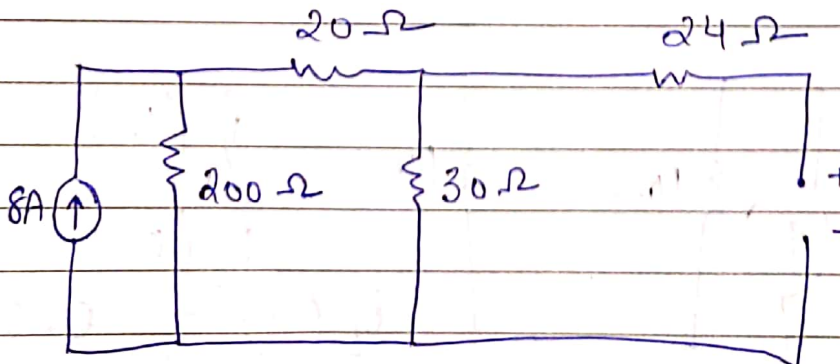
$$V_C(\infty) = 0V$$

$$V_C(t) = V(\infty) - [V(\infty) - V(0^+)]e^{-t/\tau}$$

$$= 0 - [0 - 192]e^{-t(125)}$$

$$= 192e^{-125t}$$

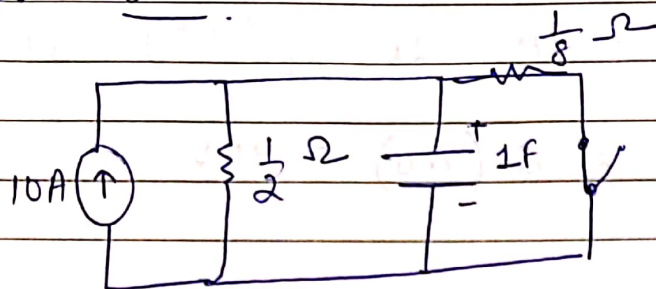
$t < 0$



Q4. 
$$v(t) = v(\infty) - [v(\infty) - v(0^+)]e^{-t/\tau}$$

$$v_c(0^-) = \frac{1}{2} \times 10 = 5V = v_c(0^+)$$

for  $t > 0$ .



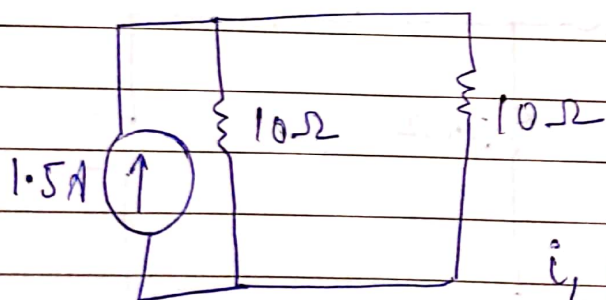
$$v(\infty) = \frac{1}{8} \parallel \frac{1}{2} = \frac{\frac{1}{2} \times \frac{1}{8}}{\frac{4}{8} + \frac{1}{8}} = \frac{\frac{1}{2} \times \frac{1}{8}}{\frac{5}{8}} = \frac{1}{2} \times \frac{1}{5} = \frac{1}{10} = R_{eq}$$

$$i_{\frac{1}{2}} = \frac{10 \times \frac{1}{8}}{\frac{5}{8}} = 2A$$

$$V = iR = 2 \times \frac{1}{2} = 1V$$

$$v(t) = 1 + 4e^{-10t}$$

Q5



$$i_L(0^-) = 0.75A$$

$$i_L(0^+) = 0.75A$$

$$i_L(\infty) = 0.5A$$

$$i_L(t) = 0.5 - (0.5 - 0.75)e^{-t/15 \times 10^{-3}}$$

$$= 0.5 + 0.25 e^{-t \times \frac{2 \times 10^3 \times 9}{7 \times 2}}$$

$$i_L(t) = 0.5 + 0.25 e^{-t(1000.0)}$$

$$i_{(10)} = \frac{1}{2} \times (1.5 - i(t))$$

$$= 0.5 + 0.125 e^{-t(1000)}$$

Q6for  $t < 0$ 

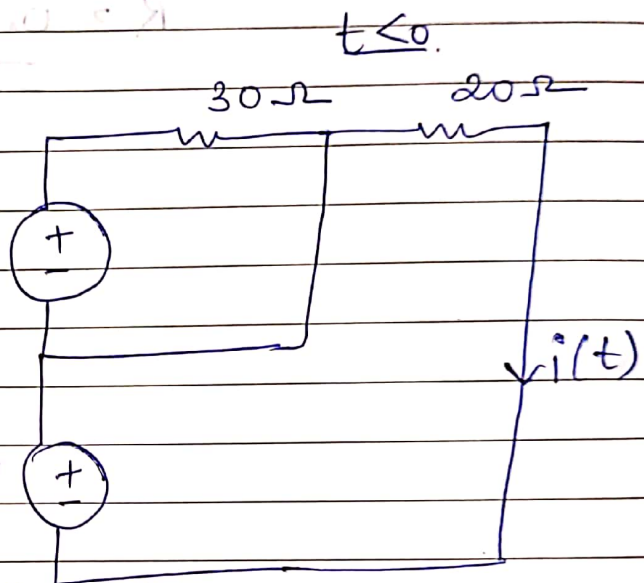
$$i(0^-) = i(0^+) = 0.5 \text{ A}$$

$$i(\infty) = \frac{30}{50}$$

$$= \frac{3}{5} \times \frac{2}{2} = 0.6 \text{ A}$$

$$i_L(t) = 0.6 - (0.6 - 0.5) e^{-t/50}$$

$$= 0.6 - 0.1 e^{-50t}$$

Q7

$$\text{for } t < 0, \quad e_1 = 3(8) = 24 \text{ V}$$

$$i(\infty) = E_2 / R$$

$$i(0^+) = i(0^-) = -8 \text{ A}$$

for  $t = 0^+$ 

$$V_L = L \frac{di(0^+)}{dt} = 2 \times 3 = 6 \text{ V}$$

$$E_2 = -V_L - R(i(0^+)) = -6 - R(-8) = 8R - 6$$



for  $t = \infty$

$$E_2 = -4R$$

because  $E_2 = -R \times i(\infty)$   
 $= -R \times 4$   
 $= -4R$

$$\text{So } -4R = 8R - 6$$

$$R = \underline{\underline{0.5 \Omega}}$$