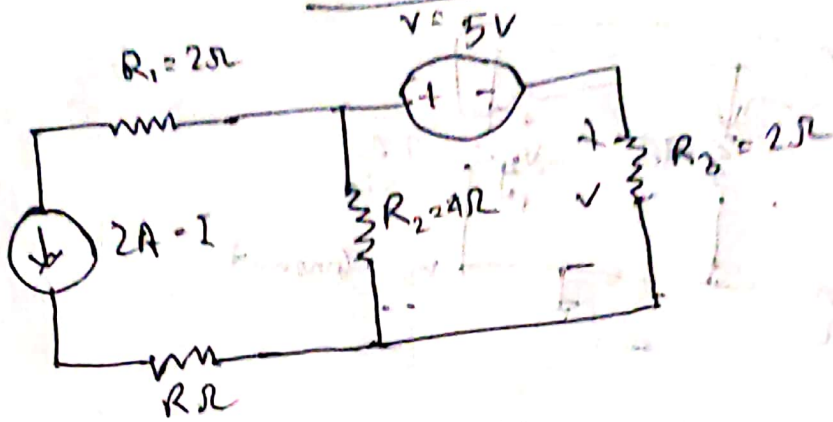
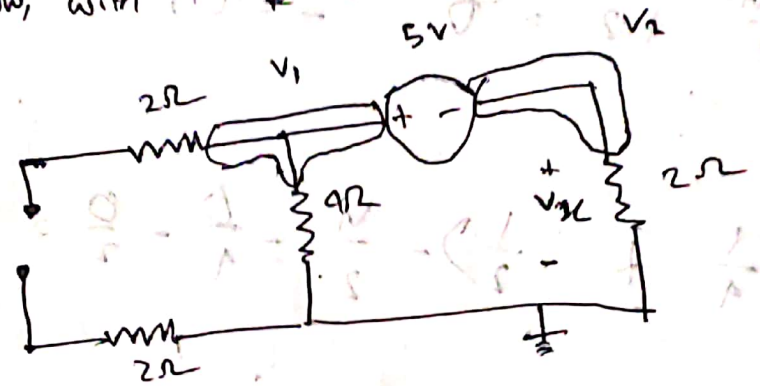
Am no. 1



Now, with V active,



V_3 = Ground

Here,

$V_1 - V_2 = 5$ — (I)

$V_2\left(\frac{1}{2}\right) - \frac{0}{2} = 0$ — (II)

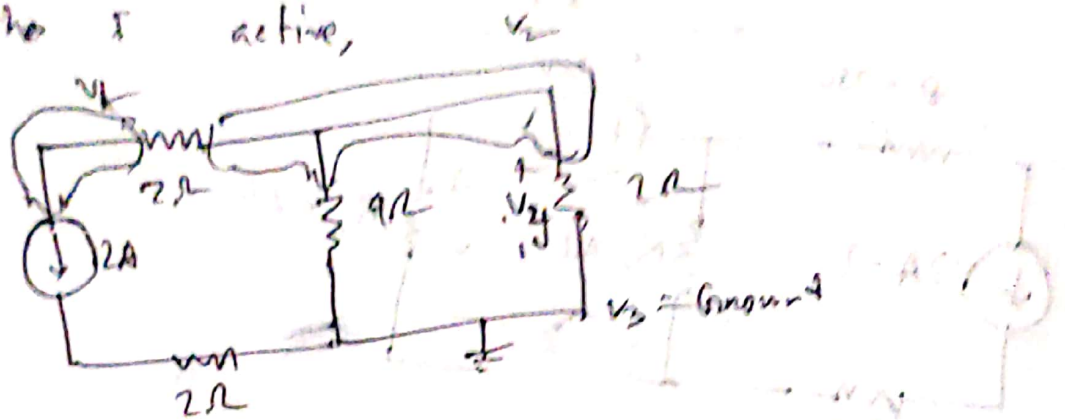
$V_3 = 0$

$\therefore V_1 = 5,\ V_2 = 0,\ V_3 = 0$

$\therefore V_{2k} = V_2 - V_3$

$= 0 - 0 = 0$ r.

With 1 active,



Now,

$$V_1\left(\frac{1}{2}\right) - \frac{V_2}{2} + 2 = 0 \quad \text{— (i)}$$

$$V_2\left(\frac{1}{2} + \frac{1}{4} + \frac{1}{2}\right) - \frac{V_1}{2} - \frac{0}{4} - \frac{0}{2} = 0$$

$$V_2 \cdot \frac{5}{4} - \frac{V_1}{2} = 0 \quad \text{— (ii)}$$

$V_3 = 0$

Hence,

$V_1 = \frac{-20}{3}$ V, $V_2 = \frac{-8}{3}$ V

Hence,

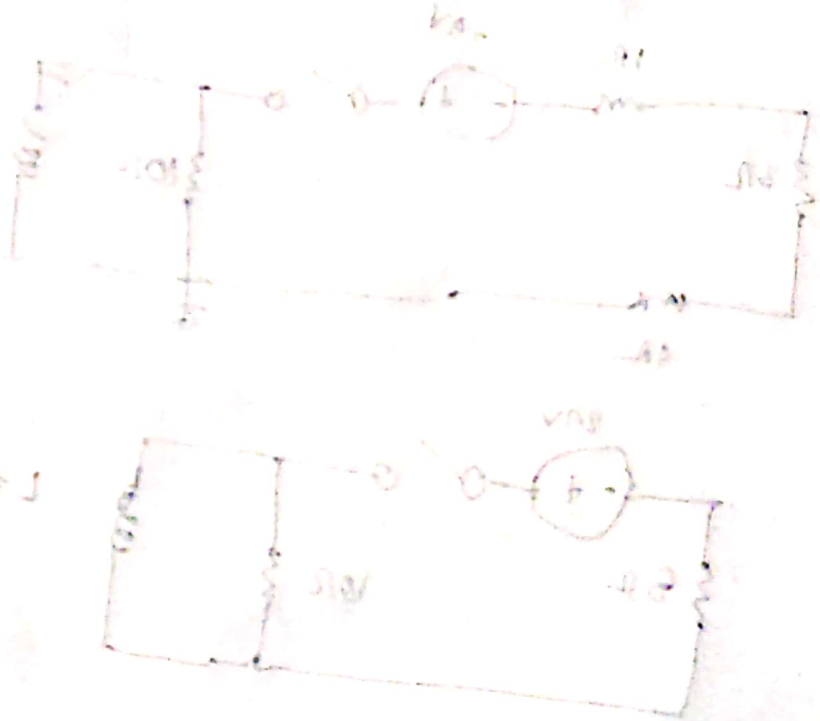
$V_y = V_2 - V_3 = \frac{-8}{3}$ V

$\therefore V = V_x + V_y$

$= 0 + \frac{-8}{3}$

$= -2.667\ V$ (Ans)

~~Ans) 20. Ω~~



Ans no. Q2

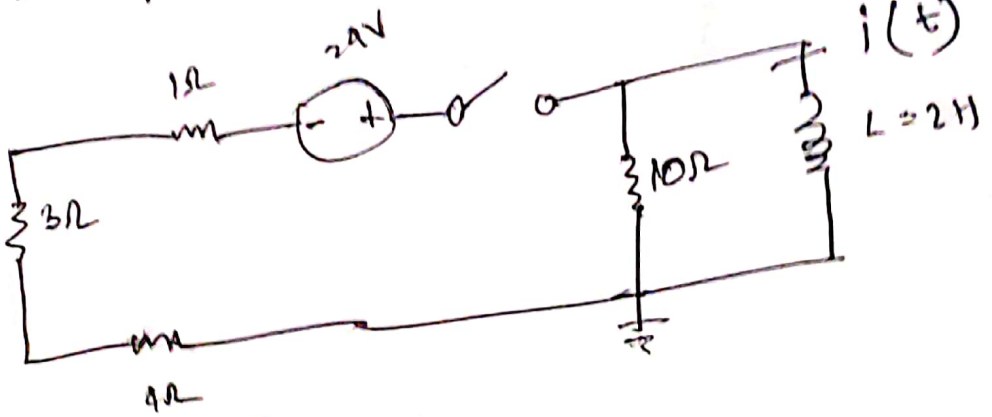
i) Time constant is known as "τ" which is used in Transient circuit and it's unit is seconds. Here for capacitors,

$$\tau = RC$$

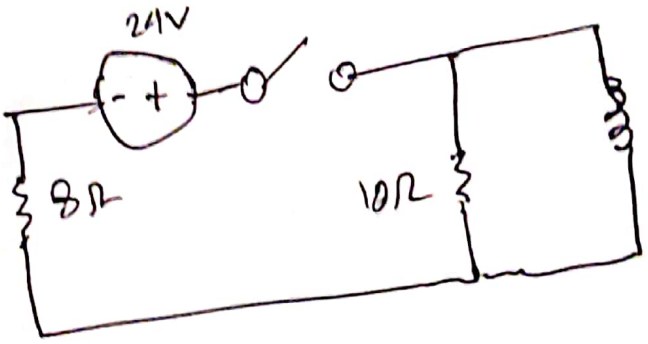
and for inductor,

$$\tau = L/R$$

ii)

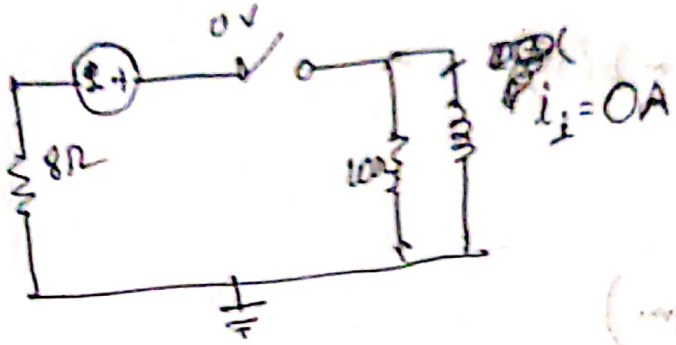


or,

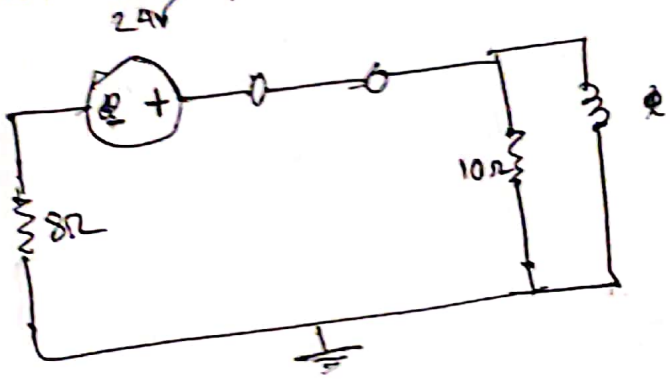


Now,

Initial Circuit,



Final Circuit,



$i_F = 3A$

Here,

$$T = L/R = \frac{2H}{10} = 0.2s$$

Here,

$$i(t) = i_f + (i_i - i_f)\, e^{-t/\tau}$$

$$= 3 + (0-3)\, e^{-t/0.2}$$

$$= 3 - 3\, e^{-5t}$$

$$= 3 - 3\, e^{-5t}$$

∴ At t = 10ms

$$i(10) = 3 - 3e^{-5(10)}$$

$$= 3A \quad (Ans)$$