Sec! 2

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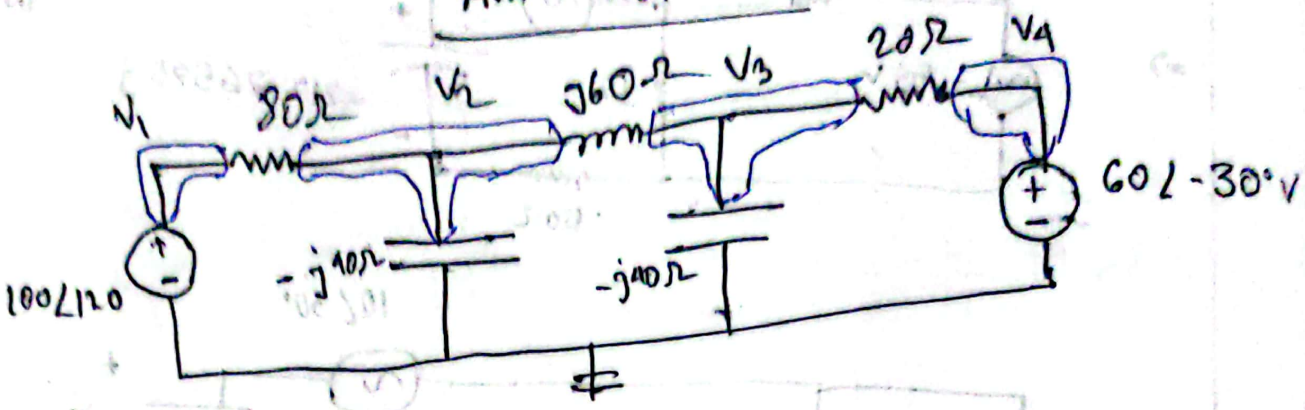
Ans no. 1




Here, there are 4 nodes,

Node 1,

$$V_1\left(\frac{1}{80}\right) - \frac{V_2}{80} = 0$$

Node 2,

$$V_2\left(\frac{1}{80} + \frac{1}{-j40} + \frac{1}{j60}\right) - \frac{V_1}{80} - \frac{V_3}{j60} = 0$$

Node 3,

$$V_3\left(\frac{1}{j60} + \frac{1}{-j40} + \frac{1}{20}\right) - \frac{V_2}{j60} - \frac{V_4}{20} = 0$$

Node 4,

$$V_4\left(\frac{1}{20}\right) - \frac{V_3}{20} = 0$$

Here,

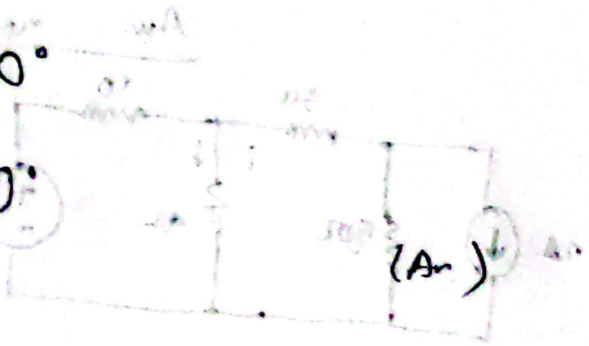
$$V_1 - 0 = 100\angle 120°$$

or, $V_1 = 100\angle 120°$

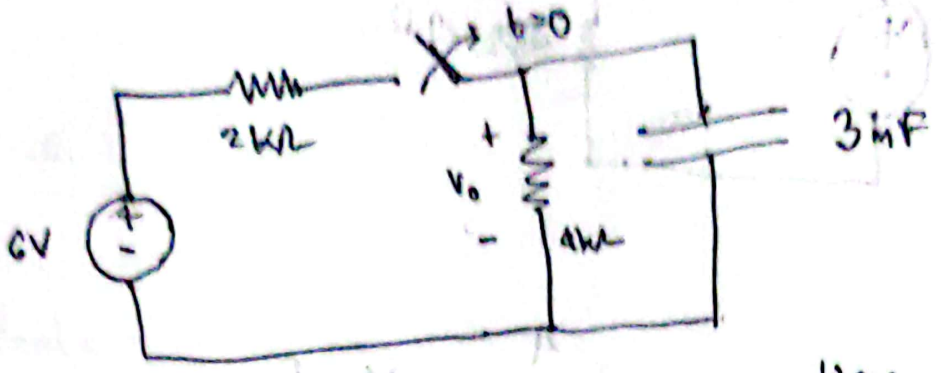
Again

$V_A - 0 = 60\angle -30°$

or, $V_A = 60\angle -30°$

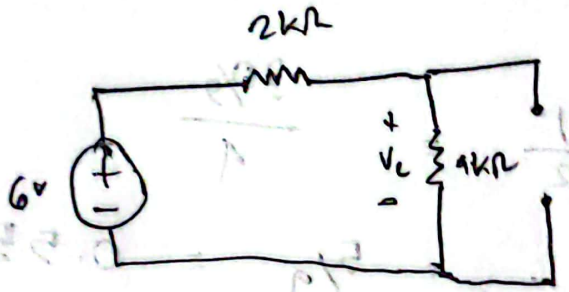


## Ans no. 2




Here,

for $t < 0$,




$$V_c = \frac{4}{2+4} \times 6$$

$$= \frac{4}{6} \times 6$$

$$= 4V$$

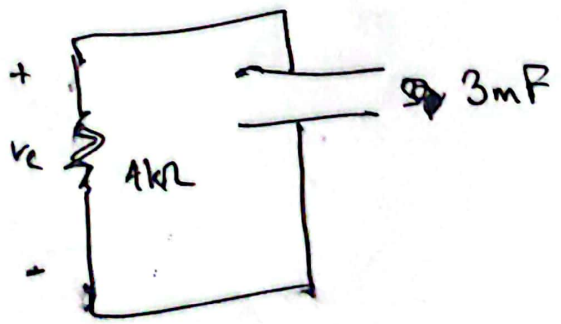
Here,

$$\tau = R \times C$$

$$= 4 \times 10^3 \times 3 \times 10^{-3}$$

$$= 12s$$

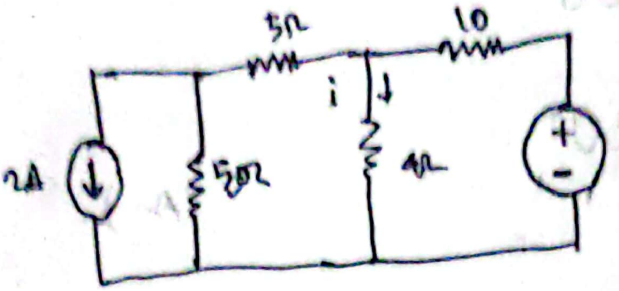
for, $t > 0$




$\therefore V_c = 0V$

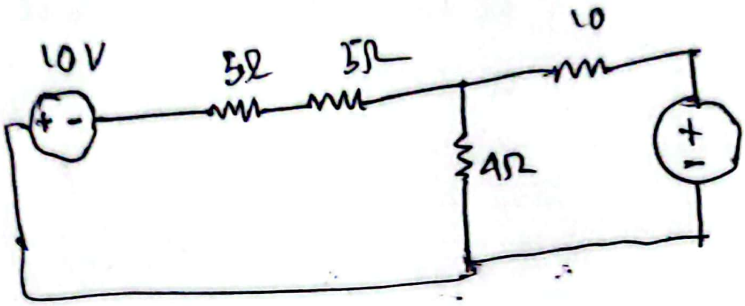
$\therefore$ At $t > 0$, $V_c = 0V$.

Ans no. 3



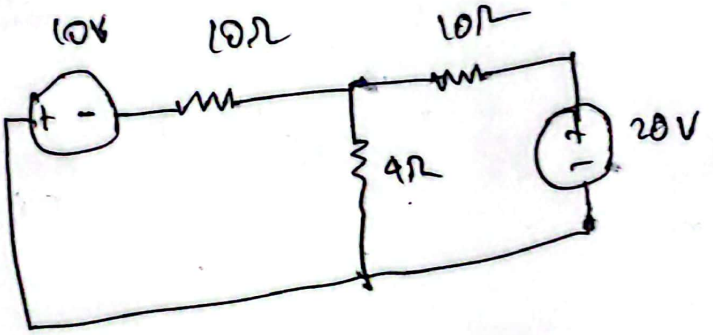

Performing Source transformation

i)

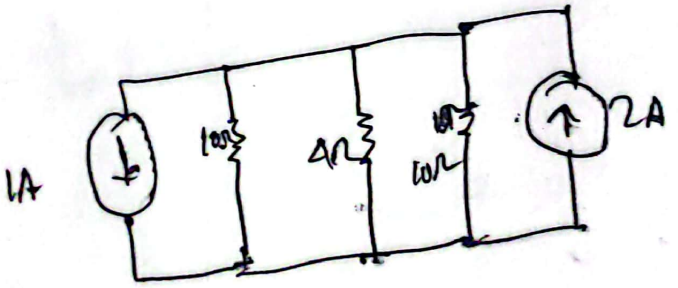



[5Ω+5Ω = 10Ω]

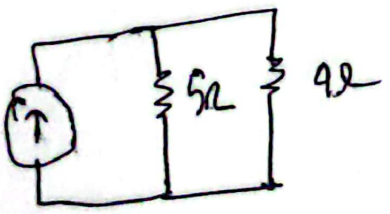
ii)




iii)



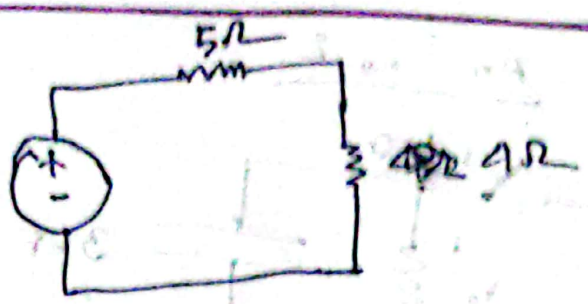

iv)




[2A as passive]

[$\frac{1}{R_p} = \frac{10 \times 10}{10+10}$]

v)




Now

$$V \text{ at } 4\Omega = \frac{4}{5+4} \times 5$$

$$= \frac{20}{9}$$

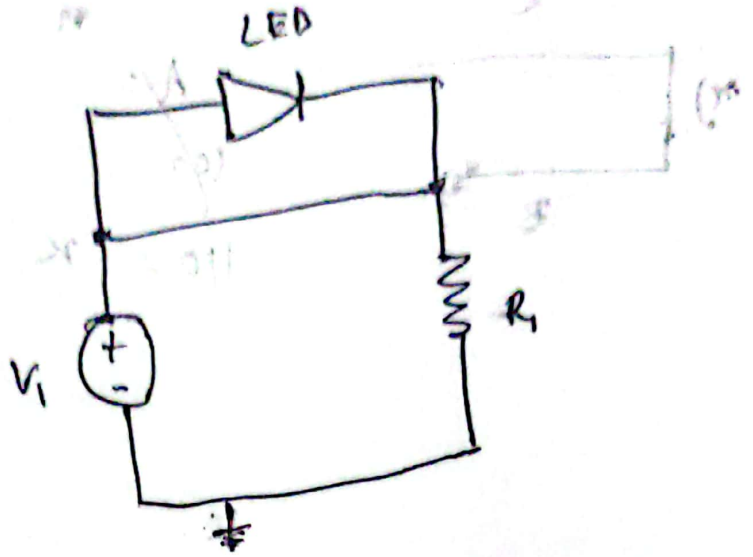
Now,

$$i \text{ at } 4\Omega, = \frac{V}{R} = \frac{20/9}{4}$$

$$= 5/9 = 0.556\ A$$

$$= 556\ mA$$

Ans no. 4




∴ Since, current has found an alternative way to go without any resistance, and LED is a passive element like resistors. No current will flow through it.

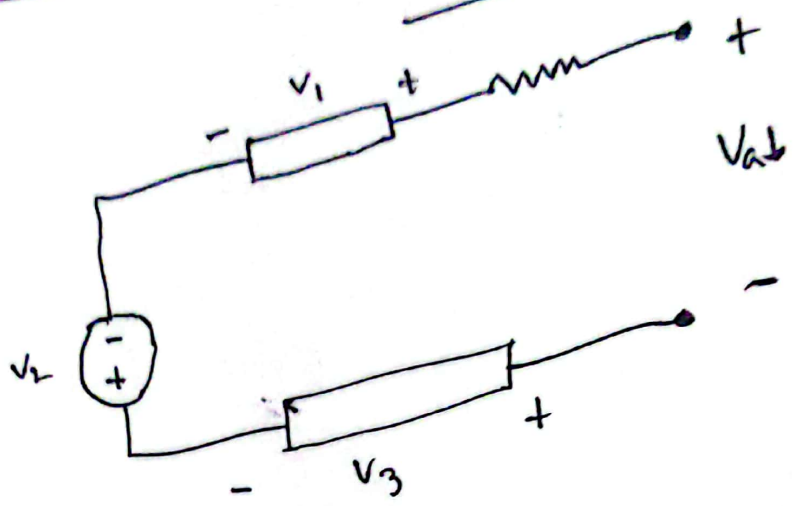
$$\therefore P = V \cdot I$$

$$= V \cdot 0 \qquad [I = 0]$$

$$= 0 \text{ W}$$

(Ans)

Ans no. 5




Here, $V_1 = 100$, $V_2 = 60V$, $V_3 = 50V$, $V_{ab} = ?$

Here $V_{ab}$ is an open circuit

Here, $V_{ab} - V_1 + V_2 + V_3 = 0$

or, $V_{ab} = V_1 - V_2 - V_3$

[following passive convention]

$= 100 - 50 - 60$

$= -10V$

(Ans.)