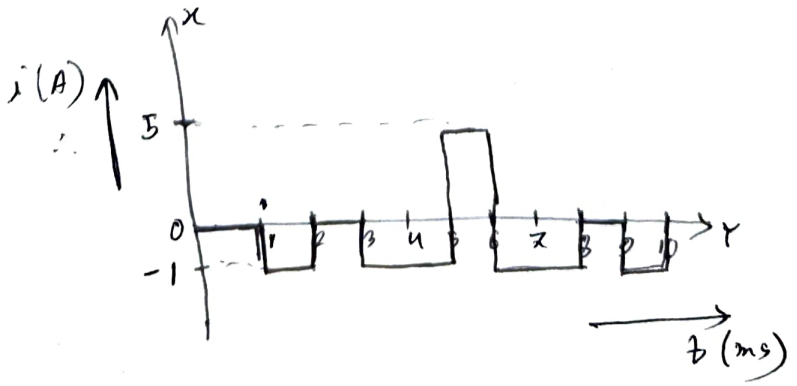
Answer to the Question NO. 1

①

$$v(t) = \begin{cases} 1 & ; 0 < t < 1 \text{ (ms)} \\ 2-t & ; 1 < t < 2 \\ 0 & ; 2 < t < 3 \\ 3-t & ; 3 < t < 5 \\ 5t-27 & ; 5 < t < 6 \\ 9-t & ; 6 < t < 8 \\ 1 & ; 8 < t < 9 \\ 10-t & ; 9 < t < 10 \end{cases}$$

$V = 12\ V$

$$\therefore i(t) = \frac{dv(t)}{dt} = \begin{cases} 0\ A & ; 0 < t < 1 \\ -1\ A & ; 1 < t < 2 \\ 0\ A & ; 2 < t < 3 \\ -1\ A & ; 3 < t < 5 \\ 5\ A & ; 5 < t < 6 \\ -1\ A & ; 6 < t < 8 \\ 0\ A & ; 8 < t < 9 \\ -1\ A & ; 9 < t < 10 \end{cases}$$

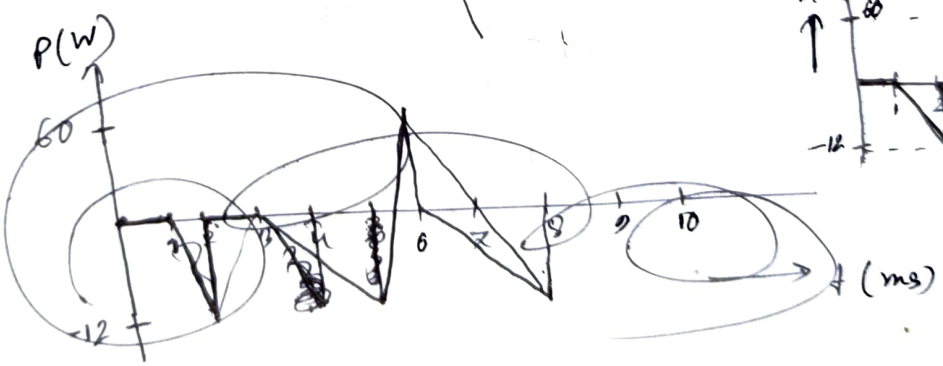


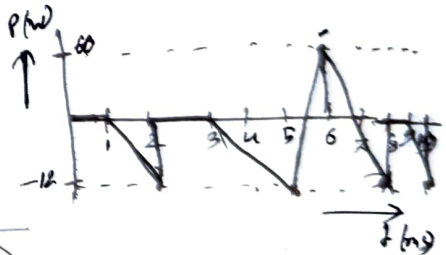
(11)

$$i(t) = \begin{cases} 0\ A; & 0<t<1 \\ -1\ A; & 1<t<2 \\ 0\ A; & 2<t<3 \\ -1\ A; & 3<t<5 \\ 5A; & 5<t<6 \\ -1A; & 6<t<8 \\ 0A; & 8<t<9 \\ -1A; & 9<t<10 \end{cases}$$

$V = 12\ V$

$$\therefore P(t) = V.i(t) = \begin{cases} 0\ w; & 0<t<1 \\ -12\ w; & 1<t<2 \\ 0\ w; & 2<t<3 \\ -12\ w; & 3<t<5 \\ 60\ w; & 5<t<6 \\ -12\ w; & 6<t<8 \\ 0\ w; & 8<t<9 \\ -12\ w; & 9<t<10 \end{cases}$$





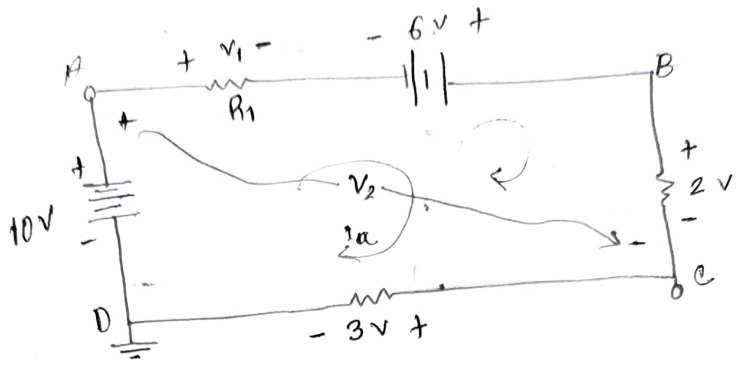
power absorb at $(5<t<6)$ ms

&

power delivered at $(1<t<2)$, $(3<t<5)$, $(6<t<8)$, $(9<t<10)$

Answer to the Question NO. 2

(a)



KVL for ABCDA Loop:

$V_1 - 6 + 2 + 3 - 10 = 0$

$\Rightarrow V_1 = 11V$ (a)

KVL in ABCA open loop:

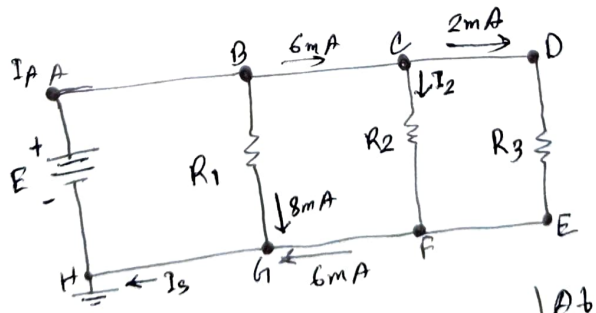
$V_1 - 6 + 2 - V_2 = 0$

$\Rightarrow 11 - 6 + 2 - V_2 = 0$

$\Rightarrow V_2 = 7V$

$\therefore V_1 = 11V$ & $V_2 = 7V$ (b)

(b)



At KCL at G point

$I_s = 8mA + 6mA$

$= 14mA$ (a)

$\therefore I_{AB} = 14mA$

At B point.

$I_{AB} = 8 + I_{BC}$

$\Rightarrow 14 = 8 + I_{BC}$

$\Rightarrow I_{BC} = 6mA$

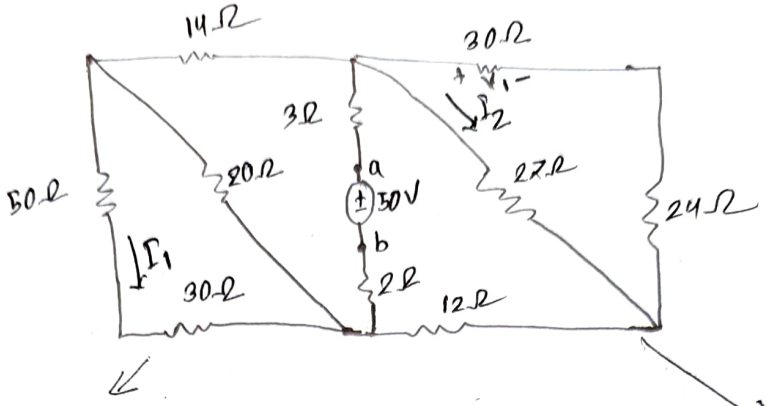
At C point.

$I_2 + 2mA = 6mA$

$\Rightarrow I_2 = 4mA$ (a)

Answer to the Question NO. 3

(i)

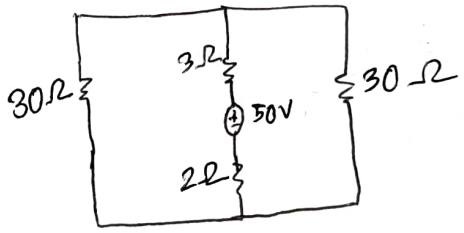


$Req_1 = ((50+30) \| 20) + 14\ \Omega$

$= 30\ \Omega$

$Req_2 = ((30+24) \| 27) + 12\ \Omega$

$= 30\ \Omega$

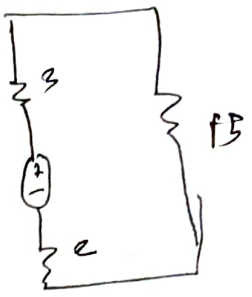


$\therefore Req = ((30 \| 30) + 3 + 2)\ \Omega$

$= 20\ \Omega$ (ii)

3(b)

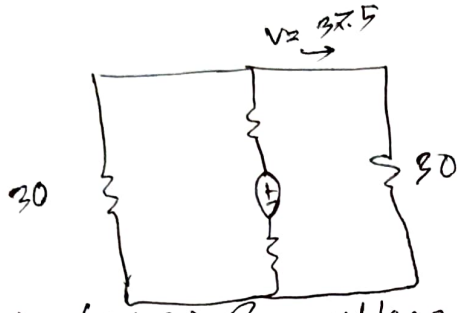
From 3(a).



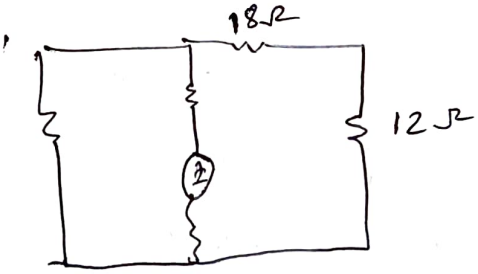
VDR →

$$V_{15} = \frac{15}{20} \times 50$$

$$= 37.5\ V$$



through (30 & 80) Ω voltage are same = 37.5 V



$$V_{18} = \frac{18}{18+12} \times 37.5$$

$$= 22.5\ V$$

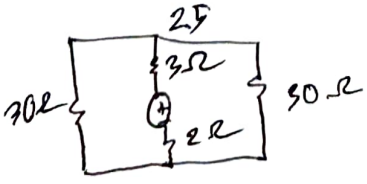
finally,

$$V_{30} = \frac{30}{30+24} \times 22.5 = 12.5\ V$$

$$\therefore I_2 = \frac{12.5}{22} = 0.46A$$

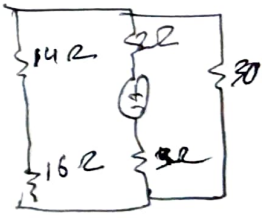
$R_{eq} = 20\Omega$

$$I = \frac{50}{20} = 2.5\ A$$



14 Ω & 16 Ω currents

$$I_{ab} = \frac{2.5}{2} = 1.25A$$



Though 50Ω, 30Ω in series. So current in 50Ω & 30Ω

$\therefore R_{eq} = (50+30) = 80\Omega$.

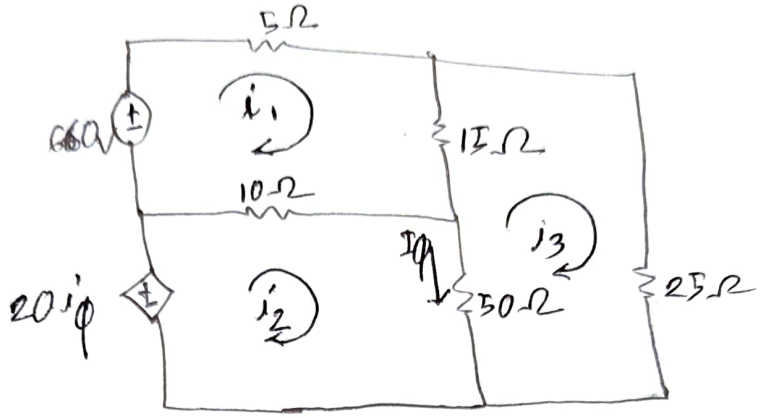
$$\therefore I_{80\Omega} = \frac{20}{20+80} \times 1.25$$

$$= 0.25\ A$$

$\therefore I_1 = 0.25\ A$

Answer to the Question No. 4

(i)



Here, $I\varphi = (i_2 - i_3)$ A

$\therefore 20i\varphi = 20(i_2 - i_3)$ A

Loop 1:

$$5i_1 + 15(i_1 - i_3) + 10(i_1 - i_2) - 660 = 0$$

$$\Rightarrow 5i_1 + 15i_1 - 15i_3 + 10i_1 - 10i_2 = 660$$

$$\Rightarrow 30i_1 - 10i_2 - 15i_3 = 660 \quad \text{——— (i)}$$

Loop 2:

$$10(i_2 - i_1) + 50(i_2 - i_3) - 20(i_2 - i_3) = 0$$

$$\Rightarrow 10i_2 - 10i_1 + 50i_2 - 50i_3 - 20i_2 + 20i_3 = 0$$

$$\Rightarrow -10i_1 + 40i_2 - 30i_3 = 0 \quad \text{——— (ii)}$$

Loop 3:

$$25i_3 + 50(i_3 - i_2) + 15(i_3 - i_1) = 0$$

$$\Rightarrow -15i_1 - 50i_2 + 90i_3 = 0 \quad \text{——— (iii)}$$

(i), (ii), (iii) $\Rightarrow$

$i_1 = 42$ A

$i_2 = 27$ A

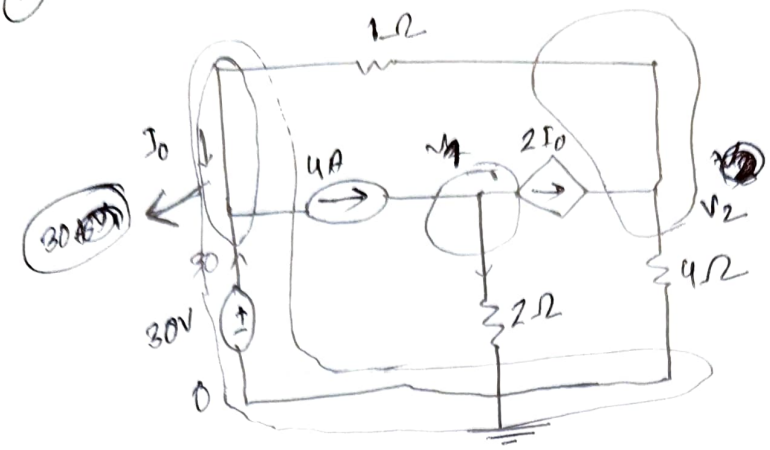
$i_3 = 22$ A

$\therefore i\varphi = (i_2 - i_3)$ A

$= (27 - 22)$ A

$= 5$ A (Ans)

(11)



$$I_0 = \frac{V_2 - 30}{1} = V_2 - 30$$

~~for node 1:~~

~~$\frac{V_2}{2} + 2I_0 = 4$~~

for node 2:

$$V_2 - 30 + \frac{V_2}{4} = 2\left(\frac{V_2 - 30}{1}\right)$$

$$\Rightarrow V_2 - 30 + \frac{V_2}{4} = 2V_2 - 60$$

$$\Rightarrow \frac{4V_2 - 120 + V_2}{4} = 2V_2 - 60$$

$$\Rightarrow 4V_2 - 120 + V_2 = 8V_2 - 240$$

$$\Rightarrow 8V_2 - 5V_2 = 240 - 120$$

$$\Rightarrow 3V_2 = 120$$

$$\therefore V_2 = 40\ V$$

$$\therefore I_0 = \frac{V_2 - 30}{1} A = \frac{40 - 30}{1} = 10\ A$$ (2)