CSE-250

Assignment-2

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Sec : 20

Ans: no-1

(a)

From figure 1 and 2 $(V, I) = (5,2)(0,-3)$

$$\frac{V-5}{5-0} = \frac{I-2}{2+3}$$

$\Rightarrow 5V - 25 = 5I - 10$

$\Rightarrow I = V - 3$. (Ans) (1)

(b)

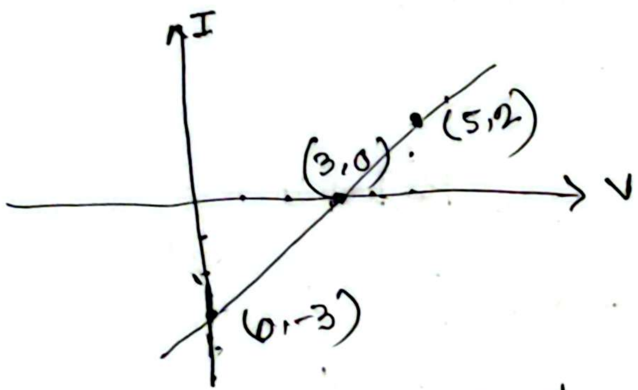
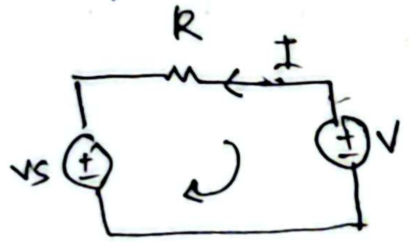
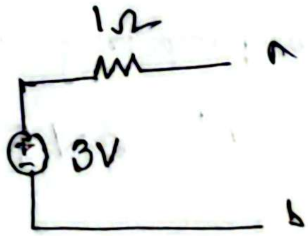


Fig: I-V graph





$-V_S - IR + V = 0$

$\Rightarrow IR = V - V_S$

$\Rightarrow I = \frac{V}{R} - V_S$. (1)

comparing eq-(1) and (2)

$R = 1$, $V = 3V$

e

circuit "x" and figure-3 will have same IV characteristics as figure-3 is an alternate version.

$$R_{eq} = \frac{\Delta V}{\Delta I} = \frac{\cancel{3-0}}{\cancel{0+3}} = \frac{5-0}{2+3} = 1\,\Omega$$

Req in circuit -x

$$0.25 + R' = 1$$

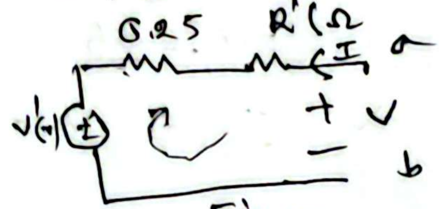


Figure 3

$R' = 1 - 0.25 = 0.75\,\Omega$ Ans'

from figure 3:

$$-V' - 0.25I - R'I + V = 0$$

$$\Rightarrow V(0.25 + 0.75) = V - V'$$

$$\therefore I = V - V' \quad \text{——— (ii)}$$

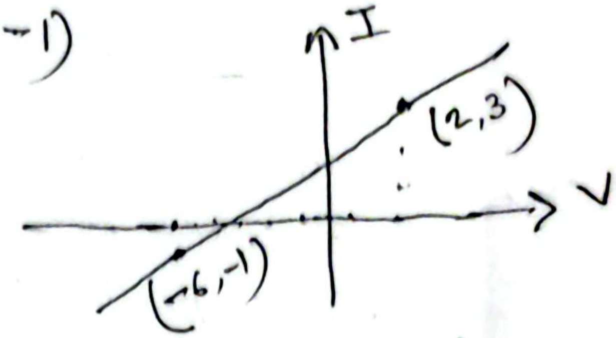
compareing eqn (ii) and eqn (i),

$v' = 3V$ [from "a"]

Ans: No. 2

a

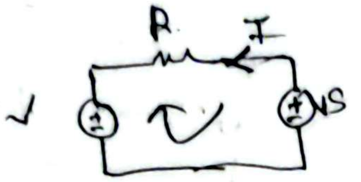
Here, $(V, I) = (2,3)\ (-6,-1)$



Now, $\dfrac{V-2}{2+6} = \dfrac{I-3}{3+1}$

$\Rightarrow 4V - 8 = 8I - 24$

$\Rightarrow I = \dfrac{V}{2} + \dfrac{\cancel{16}^{\,2}}{\cancel{8}_{\,1}} = \dfrac{V}{2} + 2 \quad \cdots (1)$



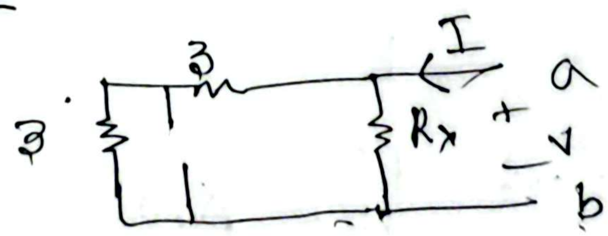
$-V - RI + V_s = 0 \quad \cdots (ii)$

$I = \dfrac{V}{R} - \dfrac{V_s}{R}$

by compare (ii), (i).

$R_{eq} = 2$

Now,



eqR. is $\left(\dfrac{1}{3+3} + \dfrac{1}{R_x}\right)^{-1} = 2$

$\therefore R_x = 3\,\Omega$

(b)

from (a) using IV eq,

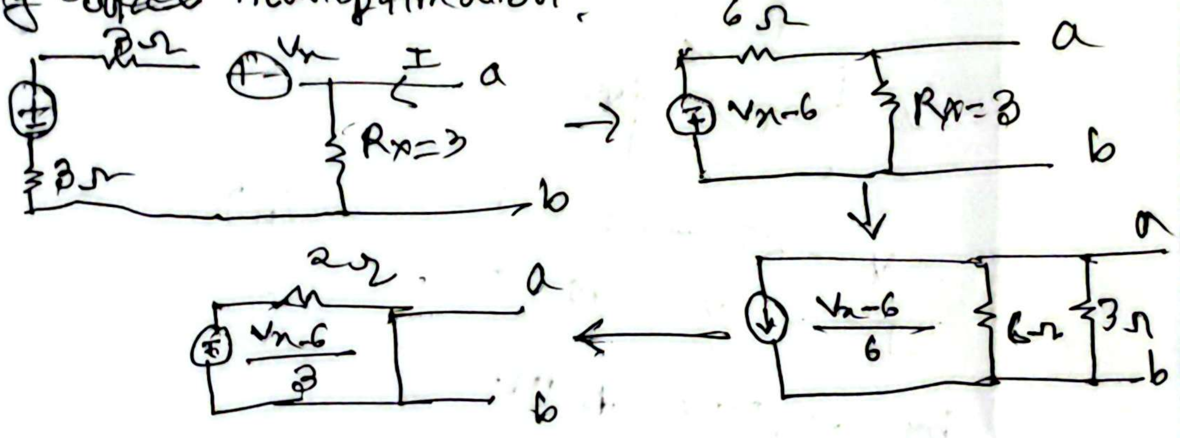
$I = \frac{V}{2} + 2$. (I)

from 'a' an Ideal ckT voltage and registors in serise connection $I = \frac{V}{R} - \frac{V_s}{R}$. (II)

by comparing (I) and (II)

$R = 2\Omega$; $2 = -\frac{V_s}{R}$ $\therefore V_s = -4V$

using ~~soqect~~ transformation:

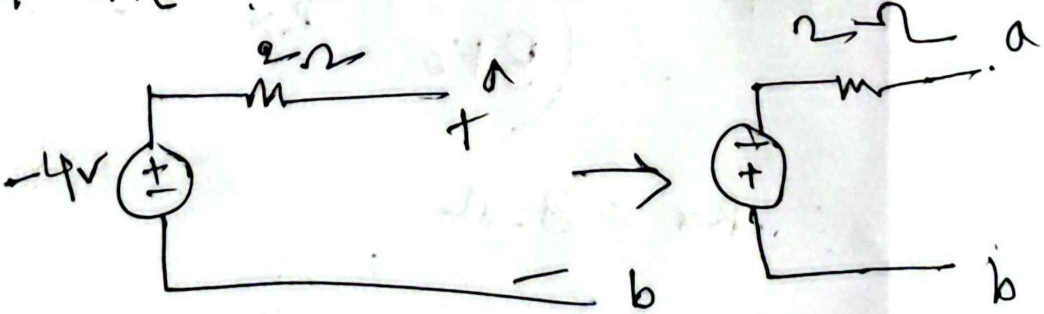


$\frac{V_x - 6}{3} = 4$.

$\Rightarrow V_x - 6 = 12$

$\Rightarrow V_x = 18V$ Ans!

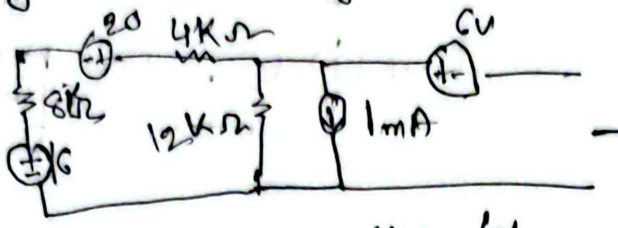
The eq-~~Ckt~~:

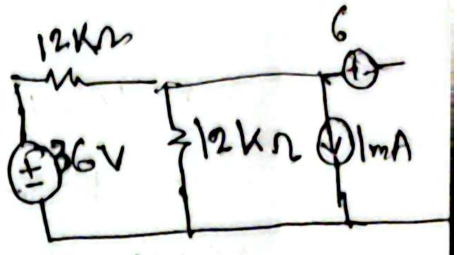


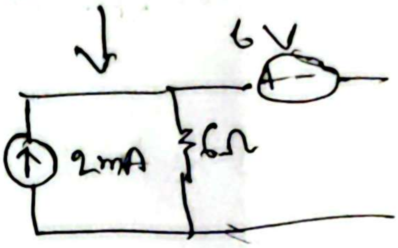
a)

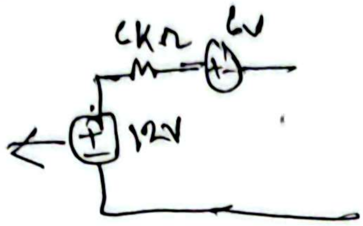
Ans: No. 4

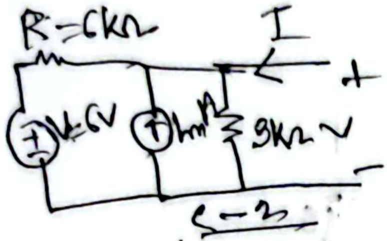
Applying source transformation







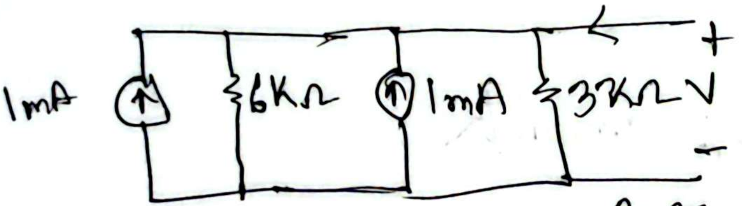


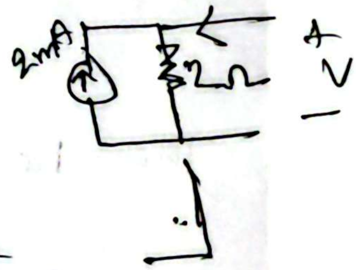


$\therefore V' = 6V \; ; \; R' = 6K\Omega$

b

Applying source transformation in C-2





Using KVL

$-4 - 2I + V = 0$

$\Rightarrow I = \frac{V}{2} - 2$

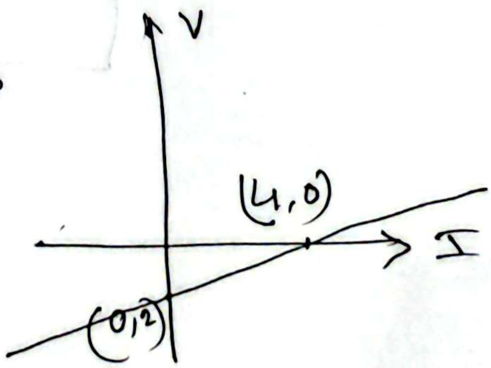


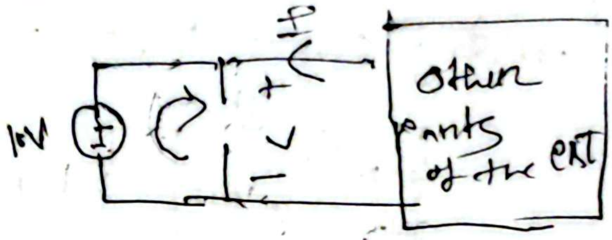
Fig: IV graph

Ans: No. 3

a) i) KVL :

$-10 + v = 0$

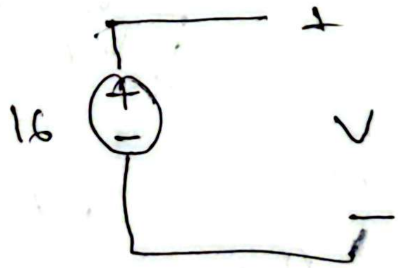
$\Rightarrow v = 10$



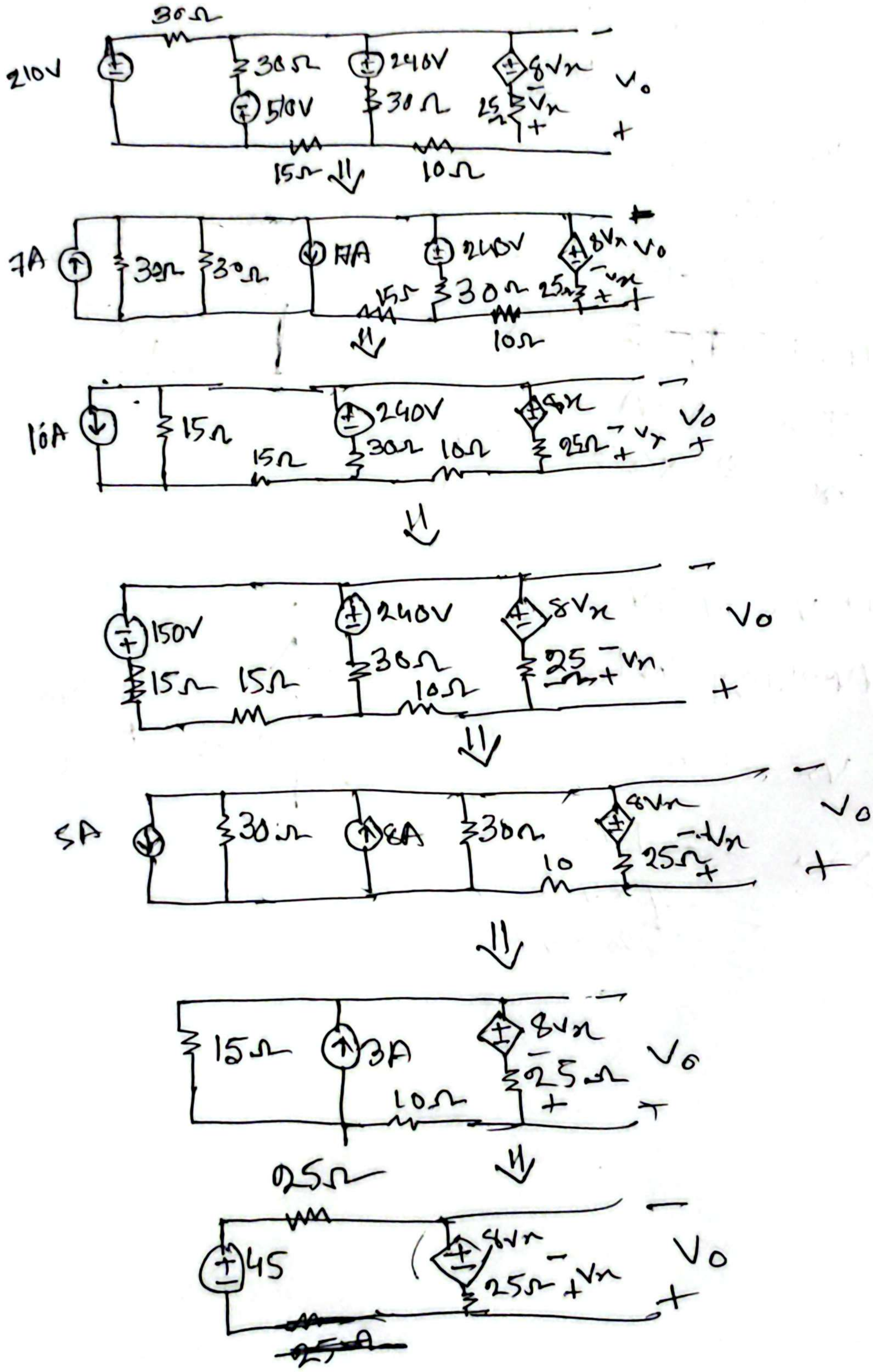
a) ii)

b.

The reduced circuit :



Ans: No. 5


30Ω
210V
30Ω
510V
240V
30Ω
8Vx
25Ω
Vx
Vo
15Ω
10Ω
7A
30Ω
30Ω
7A
240V
15Ω
30Ω
25Ω
8Vx
Vo
10Ω
10A
15Ω
15Ω
240V
30Ω
10Ω
8Vx
25Ω
Vx
Vo
150V
15Ω
15Ω
240V
30Ω
10Ω
8Vx
25
Vx
Vo
5A
30Ω
8A
30Ω
10
8Vx
25Ω
Vx
Vo
15Ω
3A
10Ω
8Vx
25Ω
Vo
25Ω
45
8Vx
25Ω
Vx
Vo

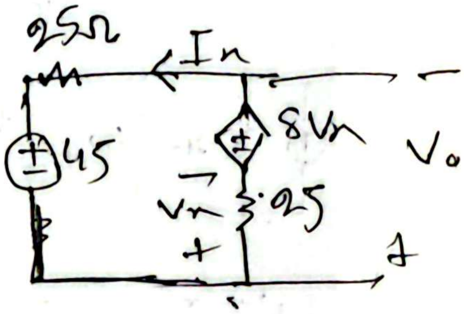
Comparing circuit Y and circuit 2 we get

$R' = 25\Omega$; $V' = 45V$

<u>b</u>

Here, $V_x = 25 I_x$

Applying KVL



$$45 + 25 I_x + 25 I_x - 8V_x = 0$$

$$\Rightarrow 45 + 50 I_x - 200 I_x = 0$$

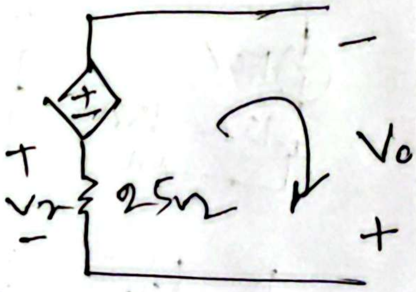
$$\Rightarrow I_x = 0.3A$$

$$\therefore V_x = 25 \times 0.3 = 7.5V$$

<u>c</u>

Here, $V_x = 7.5V$

Applying KVL,



$$V_x - 8 V_x - V_o = 0$$

$$\Rightarrow V_o = -7 V_x$$

$$= -7 \times 75$$

$$= -52.5V$$

Ans: No. 6

From graph:

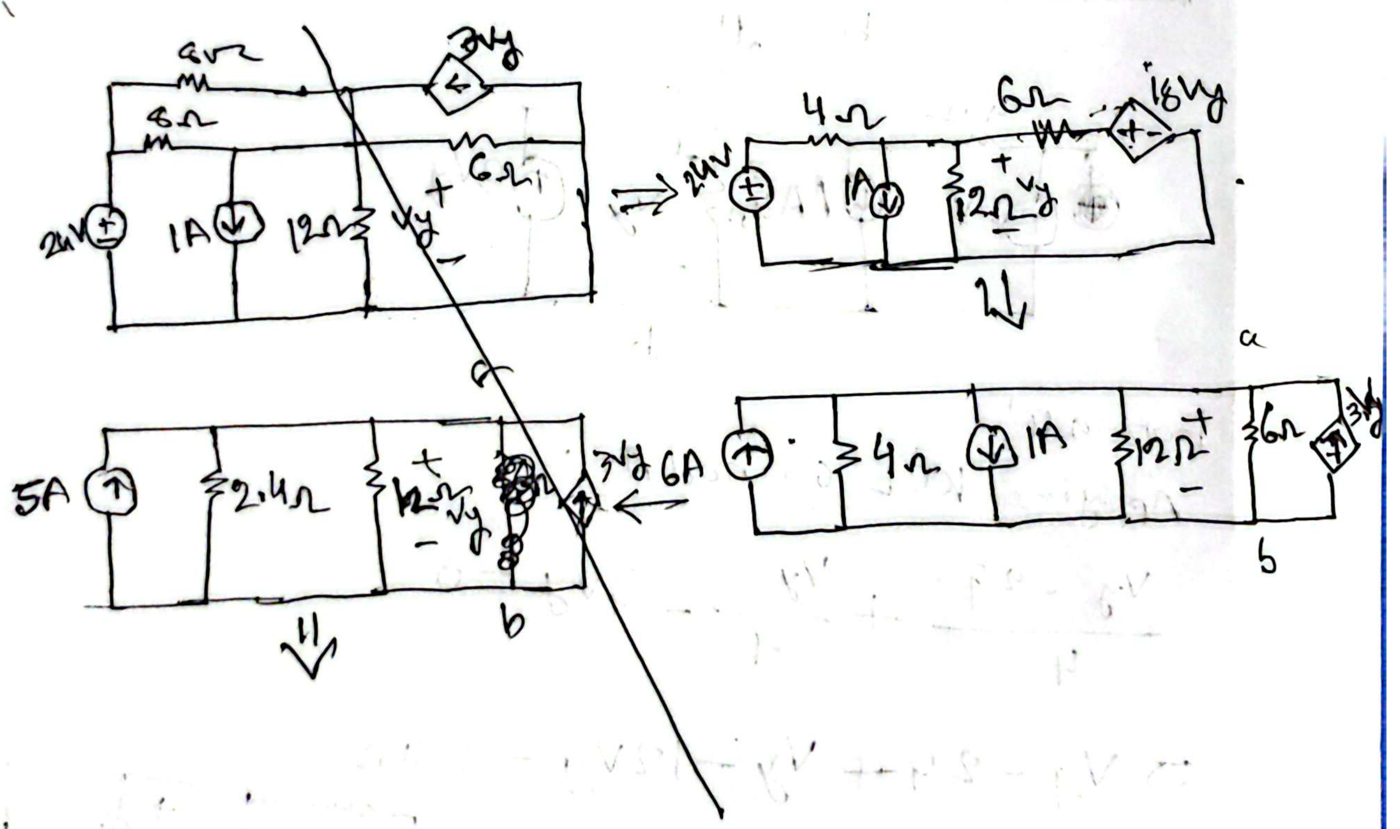
$(V, I) = (24, 0), (0, -2)$

$\therefore R_{eq} = \frac{\Delta V}{\Delta I} = \frac{24 - 0}{0 + 2} = 12\ \Omega$

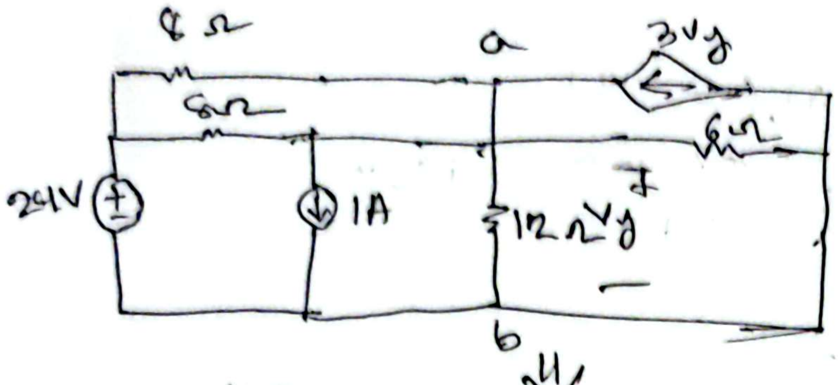
Now, $8 + R_x = 12$

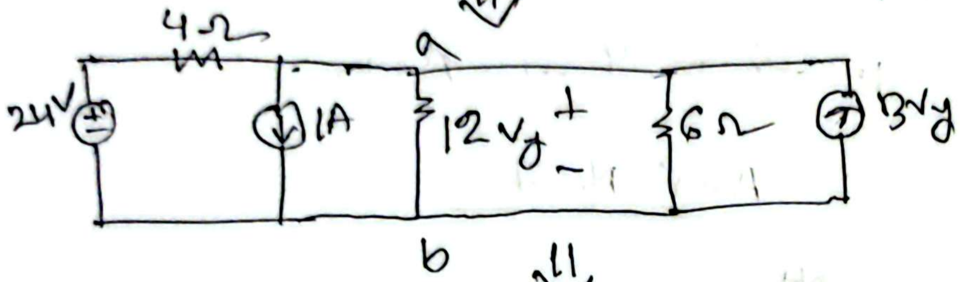
$\Rightarrow R_x = 12 - 8 = 4\ \Omega$ Ans;

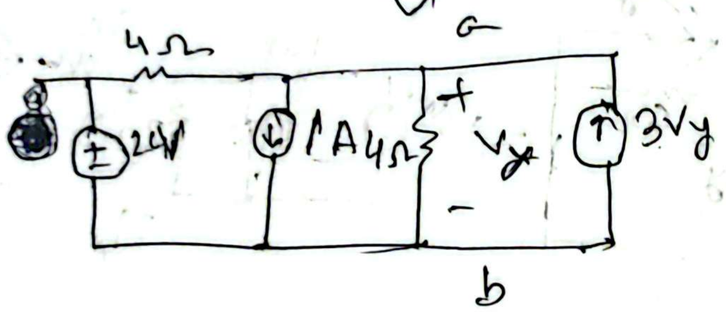
Ans: No. 7



Ans: No. 7







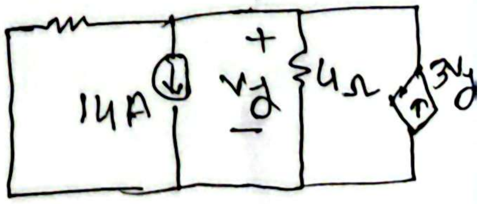
For 24 :

Applying KCL on nod A :

$$\frac{V_y - 24}{4} + \frac{V_y}{4} - 3V_y = 0$$

$$\Rightarrow V_y - 24 + V_y - 12V_y = 0$$

$$\Rightarrow V_y = -2.4V$$



For, 1 A :

Applying Kcl on node A

$$\frac{V_y}{4} + 1 + \frac{V_y}{4} - 3V_y = 0$$

$\Rightarrow V_y + 4 + V_y - 12V_y = 0$

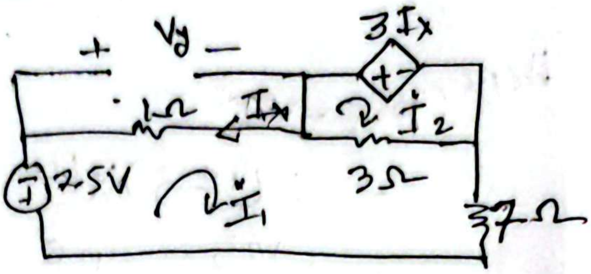
$\therefore V_y = 0.4V$

$\therefore V_y (-2.4 + 0.4)V = -2V.$ Ans;

Ans: No. 4

(a)

For, 7.5V:



Mesh. 1:

$7.5 + i_1 + 3(i_1 - i_2) + 7i = 0$

$\Rightarrow 11i_1 - 3i_2 = 7.5$ - (i)

Mesh. 2

$3I_x + 3(I_2 - I_1) = 0$

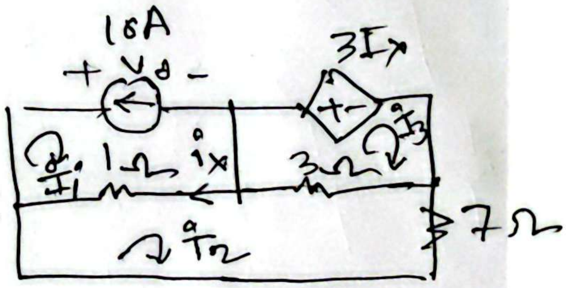
$\Rightarrow -3i_1 + 3i_2 - 3i_1 = 0$

$= 6i_1 - 3i_2 = 0$ . . (ii)

$\therefore i_1 = -1.5A$, $i_2 = -3A$ $\quad i_x = -i_1$

$V_y + i_x = 0$; $V_x - i_1 = 0$

$\therefore V_y = 1.5V$



$i_x = i_1 - i_2$

For 10A:

Mesh-1

$I_1 = -10$

Mesh-2

$1(i_1 - i_2) + 3(i_3 - i_2) = 0$

$\Rightarrow -6i_2 + 3i_3 = 30$ - (ii)

$\therefore i_1 = -10A$, $i_2 = 4A$, $i_3 = 18A$

$\therefore V_x + (i_1 - i_2) = 0$

$\therefore V_x = -(-10 - 4)$

$= 14V$

$\therefore$ total $V_x = (14 + (-1.5)) = 12.5V$ Ans.

(b)

Here, $p = -VI$

$= -(12.5) \times 10$ From (a)

$= -125$ sue

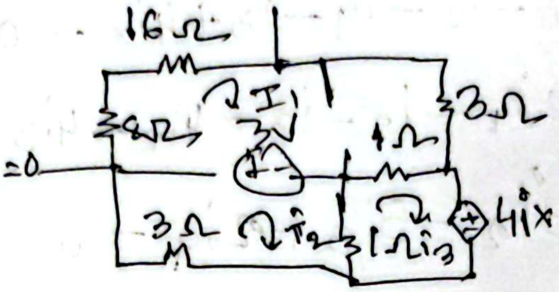
So, the current is supplying power

Ans: No. 9

For 3V:

Mesh 1:

$6i_1+16i_1+3i_1+2(i_1-i_3)-3=0$



$\Rightarrow 28i_1-i_3=3 \quad \text{--- (i)}$

Mesh 2

$3+i_2-i_3+3i_2=0$

$\Rightarrow 4i_2-i_3=-3 \quad \text{--- (ii)}$

Mesh 3:

$4i_x+i_3-i_2+i_3-i_1=0$

$\Rightarrow 4i_2-4i_3+2i_3-i_2-i_2=0 \quad (i_x=i_2-i_3)$

$\Rightarrow -i_1+3i_2-2i_3=0 \quad \text{--- (iii)}$

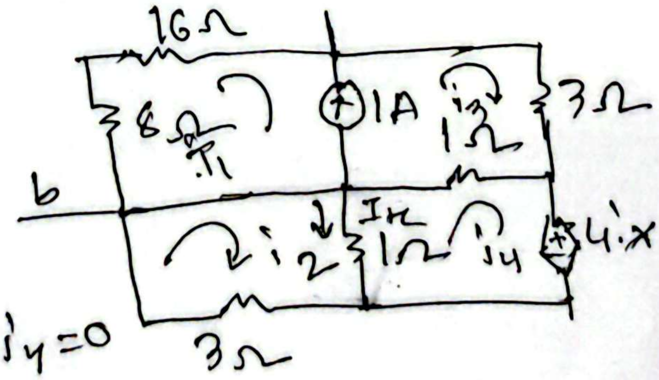
$\therefore i_1=0.042A\ ,\ i_2=-1.21A\ ,\ i_3=-1.833A$

$\therefore i_x=-1.21+1.833=0.623A$

For 1A:

Supermesh:

$i_3-i_1=1 \quad \text{(i)}$



$6i_1+16i_1+3i_3+i_3-i_4=0$

$\Rightarrow 24i_1+4i_3-i_4=0 \quad \text{(ii)}$

Mesh 4:

$i_4 - i_2 + i_4 - i_3 + 4i_x = 0$

$\Rightarrow 2i_4 - i_2 - i_3 + 4i_2 - 4i_3 = 0 \quad [i_x = i_2 - i_3]$

$\Rightarrow 3i_2 - 5i_3 + 2i_4 = 0$

$\therefore i_1 = -0.0833A,\ i_2 = 0.4166A,\ i_3 = 0.916A$

$i_4 = 1.66\ A$

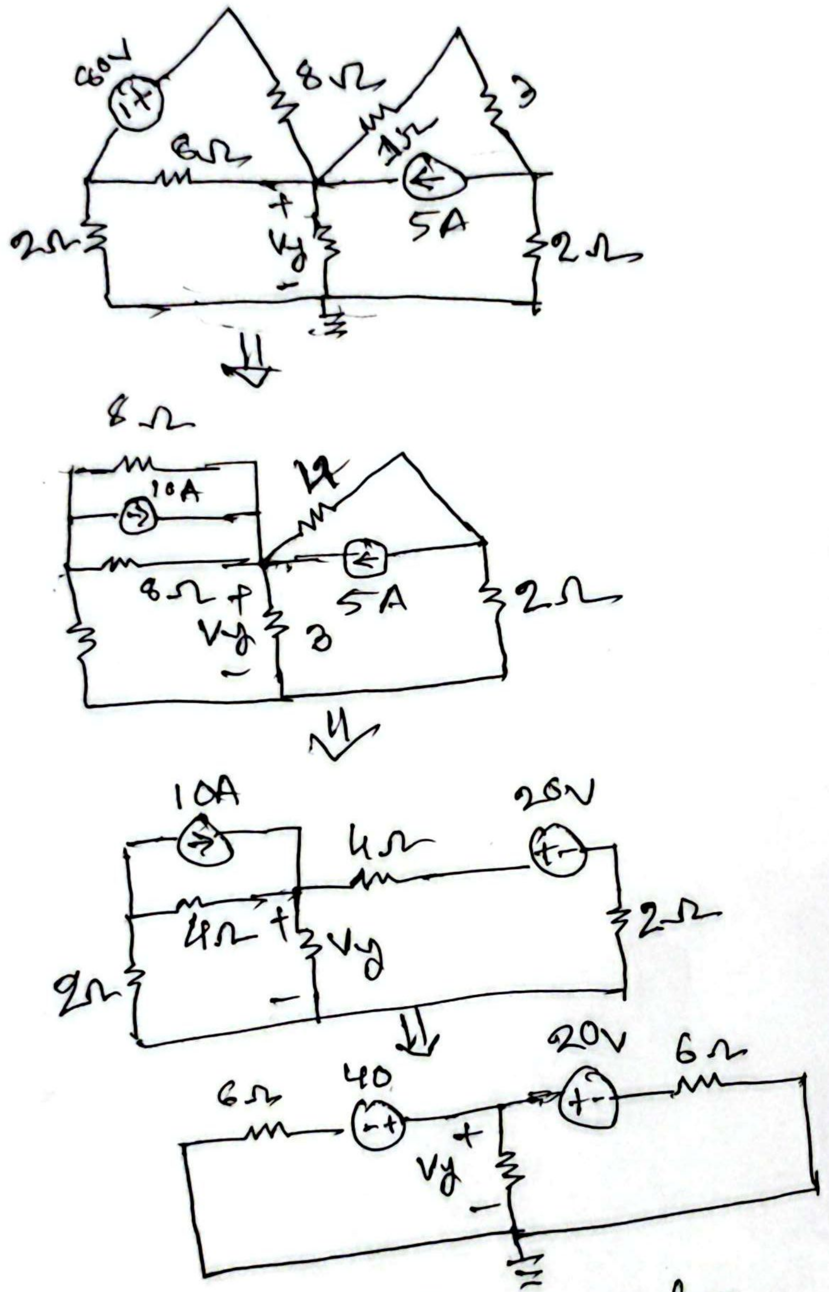
$I_x = i_2 - i_3 = (\cancel{0.62}\ 0.4166 - 0.916)\ A$

$= -0.5$

$\therefore I_x = (0.623 + (-0.5)) = 0.123A$

Ans!

Ans; No. 10



Applying Nodal analysis we get,

$$\frac{V_y - 20}{6} + \frac{V_y - 40}{6} + \frac{V_y}{3} = 0$$

$$\Rightarrow \frac{V_y}{6} + \frac{V_y}{6} - \frac{20}{6} - \frac{40}{6} + \frac{V_y}{3} = 0$$

$$\Rightarrow \frac{2}{3} V_y = 10$$

$\therefore V_y = 15\,V$ Ans: