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Electrical Enginnering

Kavya Dixit

BTBTC23147

Submitted to- Vivek Sir

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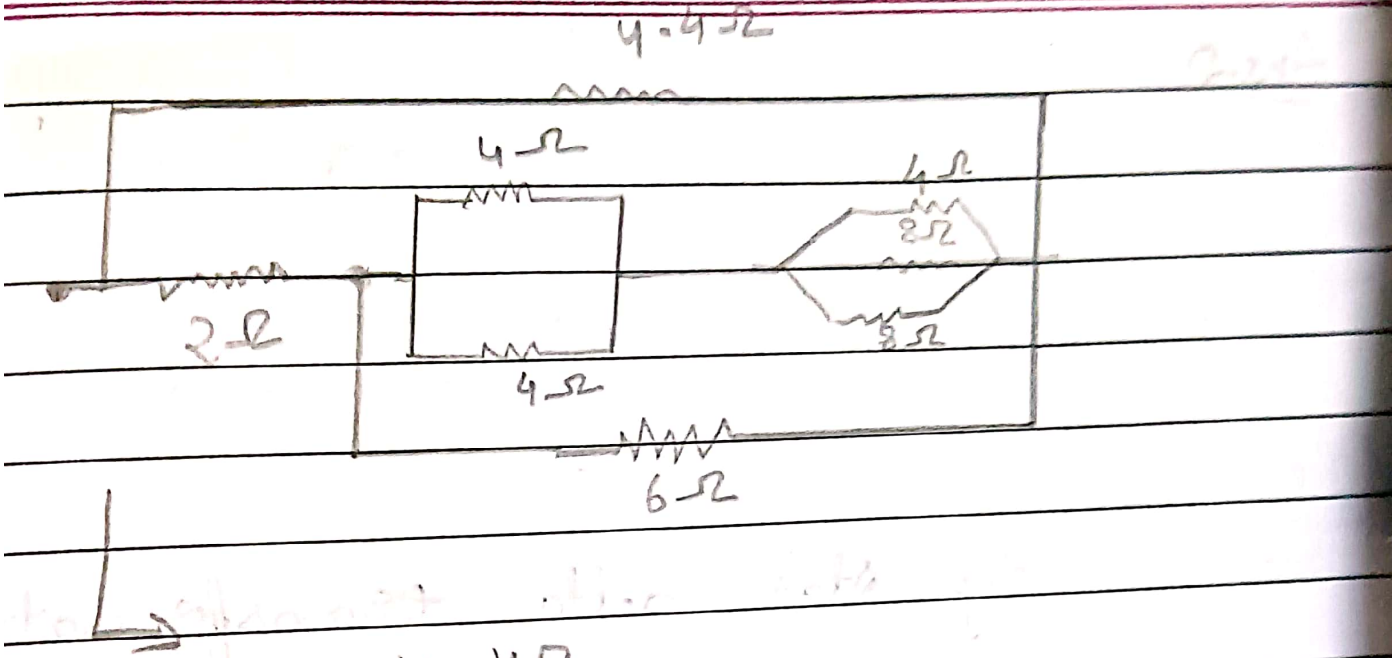
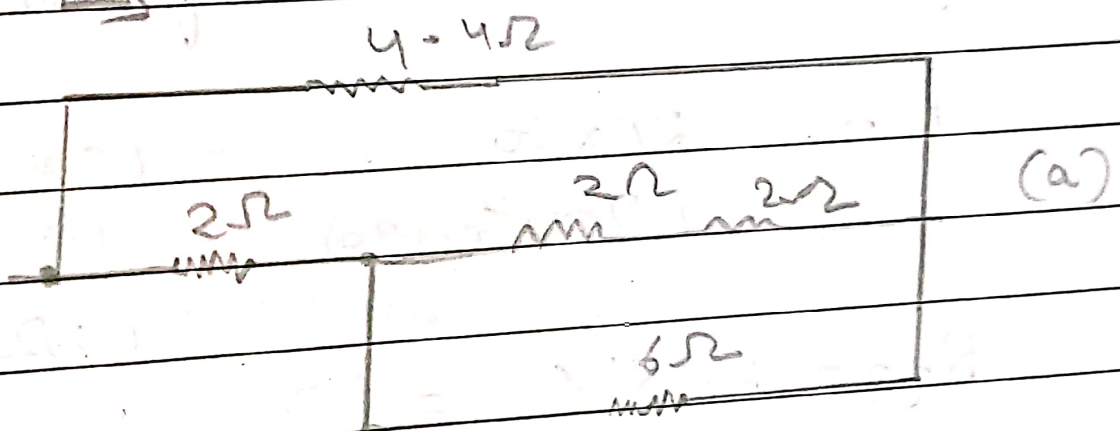
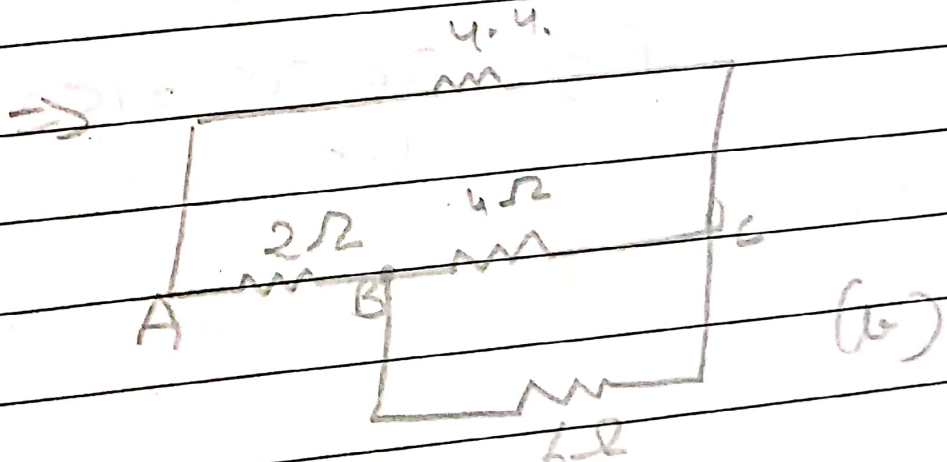




(a)



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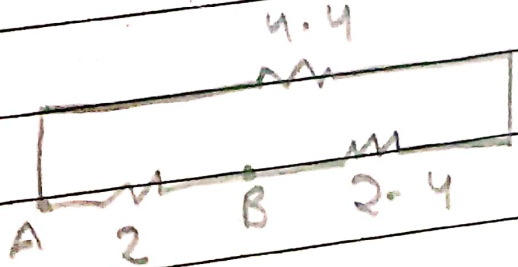
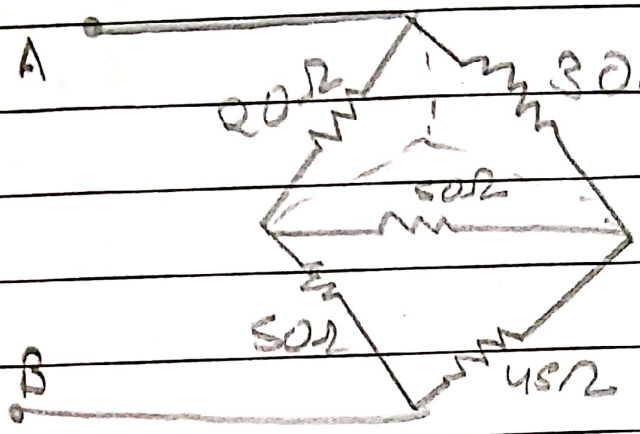


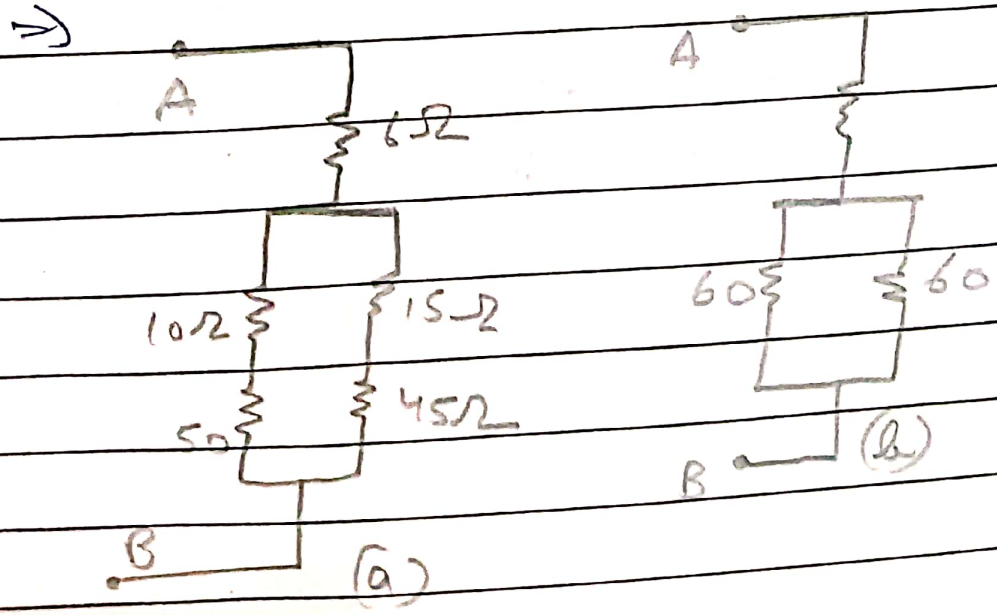


By star delta transformation

$$R_{12} = \frac{20 \times 50}{(20+50+30)} = \frac{1000}{100} = 10\Omega$$

$$R_{23} = \frac{20 \times 30}{100} = 6\Omega$$

$$R_{31} = \frac{30 \times 50}{100} = 15\Omega$$



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c) A — 6 — 30 — B

for fig (b)

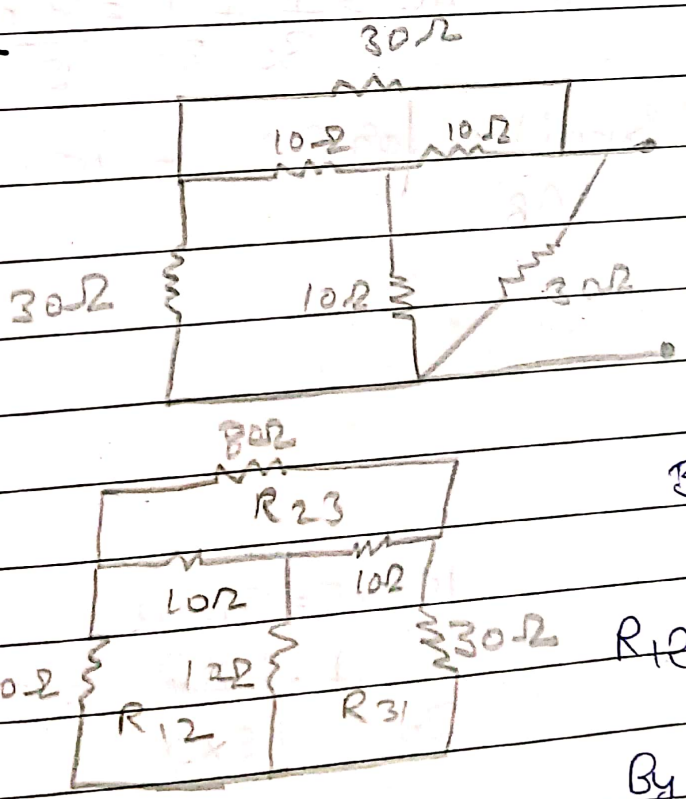
$\frac{1}{60} + \frac{1}{60} = \frac{2}{60} = 30\Omega$

as $(10+50)\Omega = 60\Omega$

and $(15\Omega + 45\Omega) = 60\Omega$

$6 + 30\Omega = 36\Omega = Req.$ b/w A & B

Ans-3



By star delta transformation

$R_{12} = 10 + 10 + \frac{10 \times 10}{10}$

By formula;

$R_{AB} = R_A + R_B + \frac{R_A R_B}{R_C}$

$R_{12} = R_{23} = R_{31} = 30\Omega$

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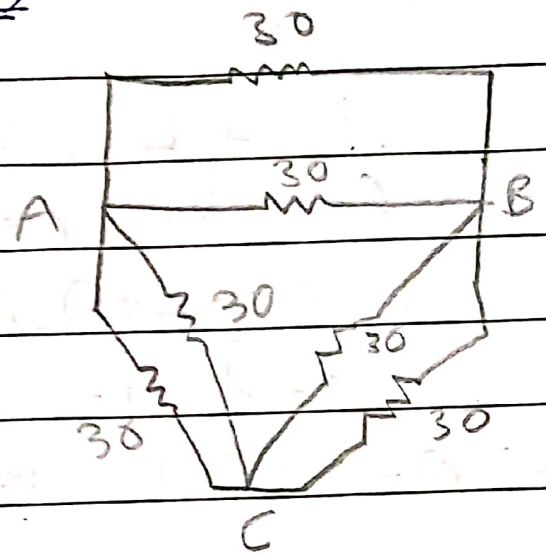
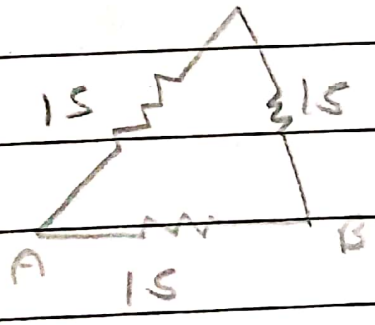
Now,



now r/w AC $\Rightarrow \frac{1}{30} + \frac{1}{30} = \frac{30}{2} = 15\Omega$

↳ Similar for BC $= 15\Omega$

AB =



$15+15 = 30\Omega$

$\therefore \frac{1}{30} + \frac{1}{15\times2} = \frac{30}{3} = 10\Omega = R_{eq}$

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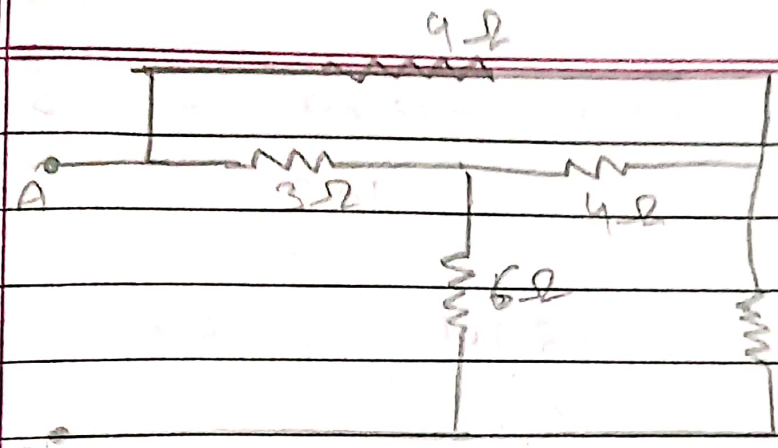
4)

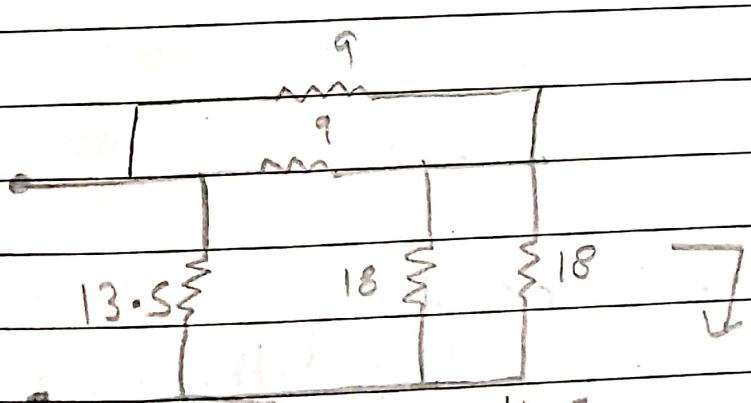


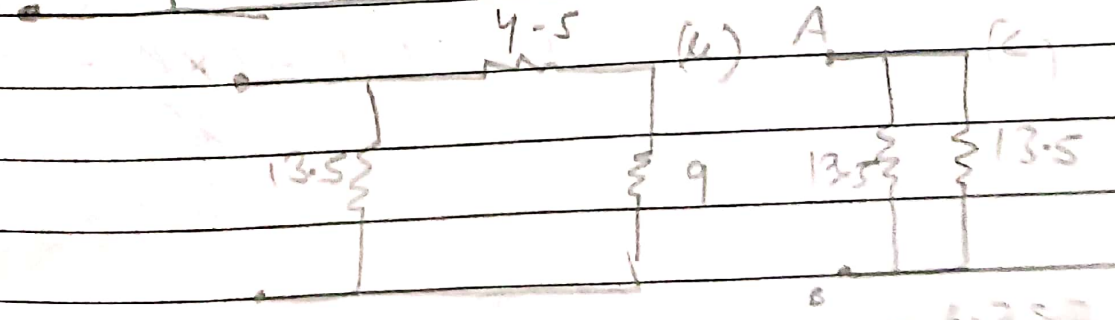
By star delta transformation

$$R_{12} = 6+3+\frac{6\times3}{4} = 13.5$$

$$R_{23} = 3+4+\frac{3\times4}{6} = 9$$

$$R_{31} = 6+4+\frac{6\times4}{3} = 18$$





= 6.75Ω

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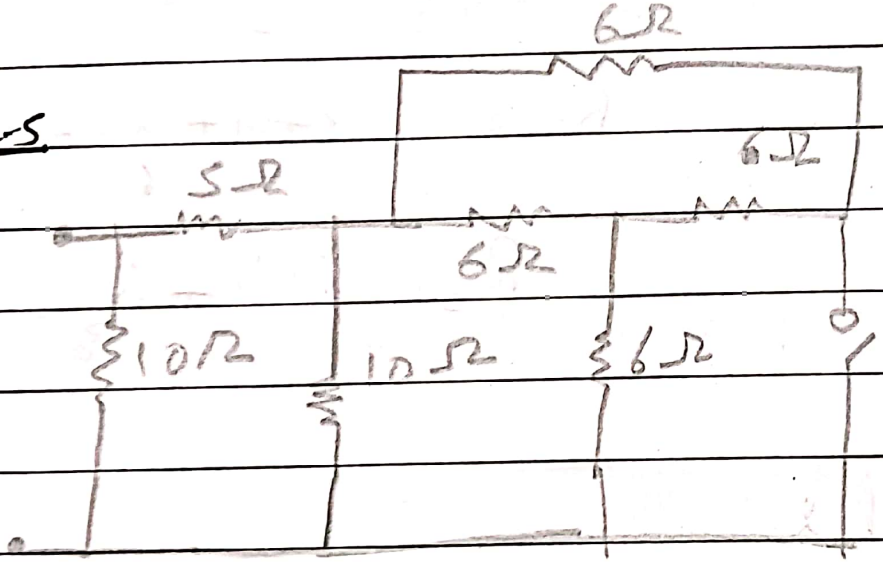
a → (9 || 9) = $\frac{9 \times 9}{9+9}$ = 4.5

$\frac{18 \times 18}{18+18}$ = 18Ω

b) 4.5 + 9 = 13.5

c) $\frac{13.5 \times 13.5}{13.5+13.5}$ = 6.75Ω

ns-5.



1 Switch is closed

By Star delta transformation

$R_{12} \rightarrow 6+6+\frac{6 \times 6}{6} = 18 = R_{23} = R_{31}$

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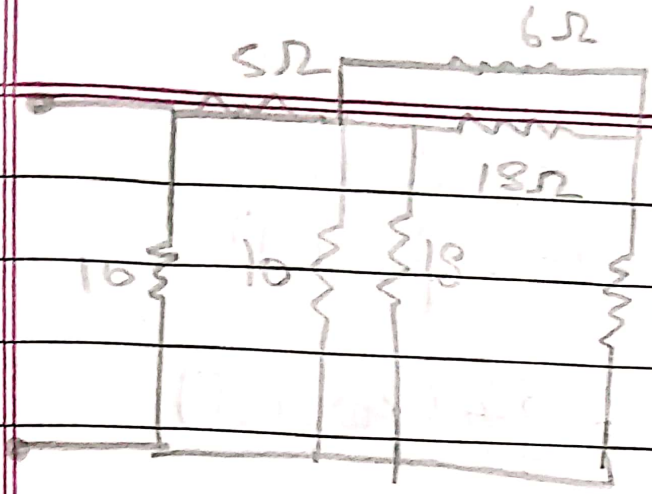
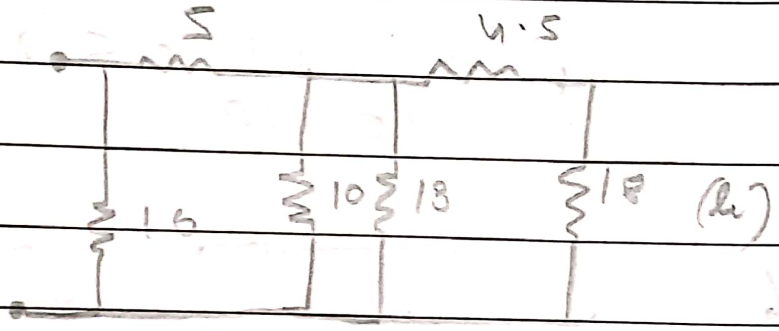
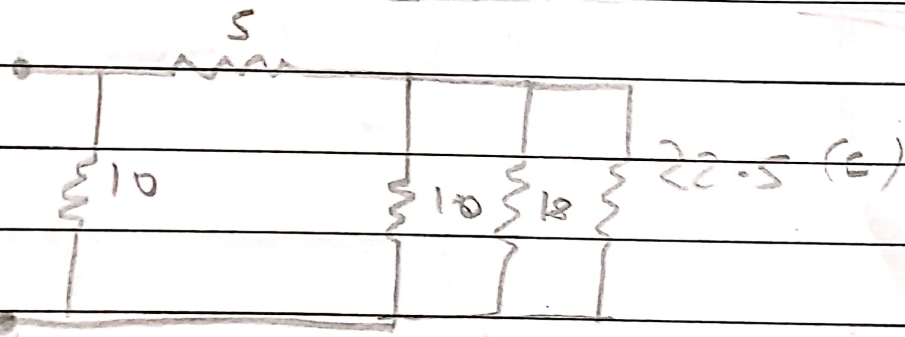
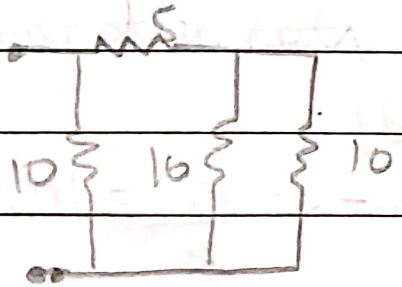




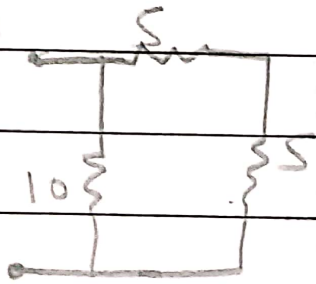
(b)



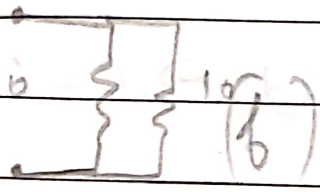
(c)



(d)



(e)



(f)

• fig (a) $\rightarrow \frac{1}{6} + \frac{1}{18}$

$= 4.5\Omega$

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b) $4.5 + 18 = 22.5\ \Omega$ (series)

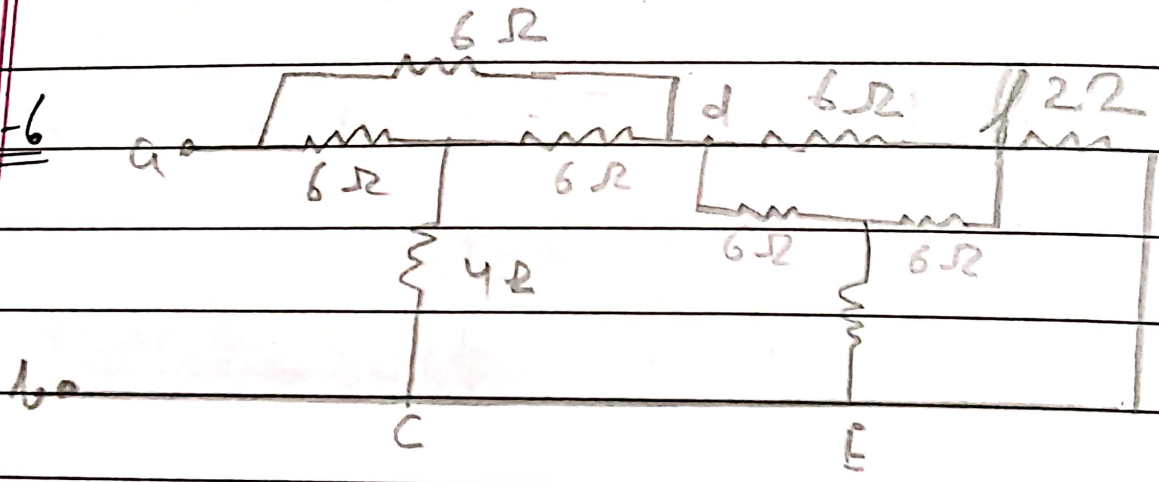
c) $\frac{1}{22.5} + \frac{1}{18} = 10\ \Omega$ (parallel)

d) $\frac{1}{10} + \frac{1}{10} = 5\ \Omega$ (parallel)

e) $5 + 5 = 10\ \Omega$ (series)

f) $= \frac{1}{10} + \frac{1}{10} = 5\ \Omega$ (parallel)

Ans-6



Applying ~~star~~ delta transformation in df c.

$R_{de} \Rightarrow 6 + 2 + \frac{6 \times 2}{6} = 10\ \Omega$

$R_{fc} \Rightarrow 6 + 2 + \frac{6 \times 2}{6} = 10\ \Omega$

$R_{df} \Rightarrow 6 + 6 + \frac{6 \times 6}{2} = 30\ \Omega$

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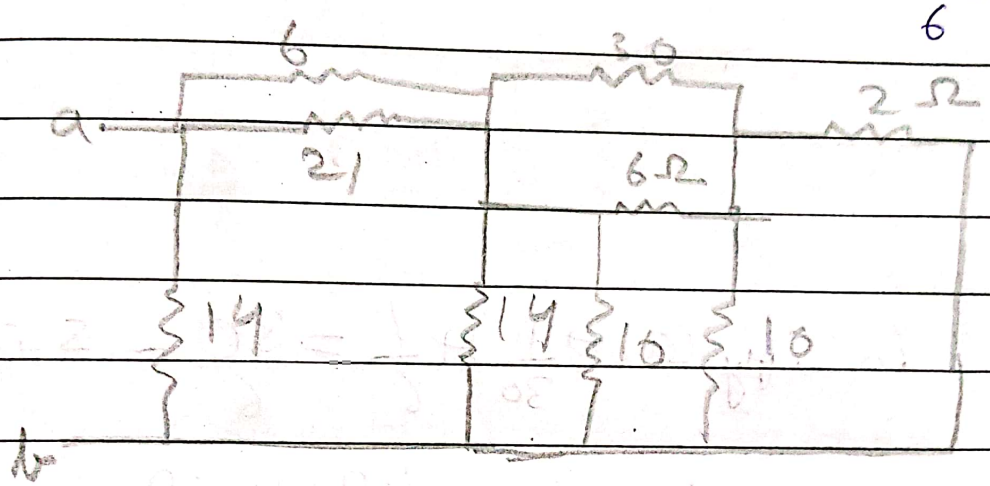
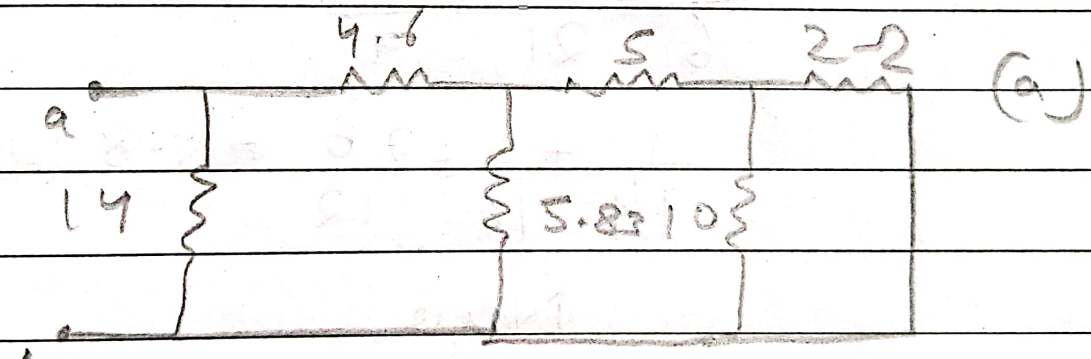
Applying star delta in ads,

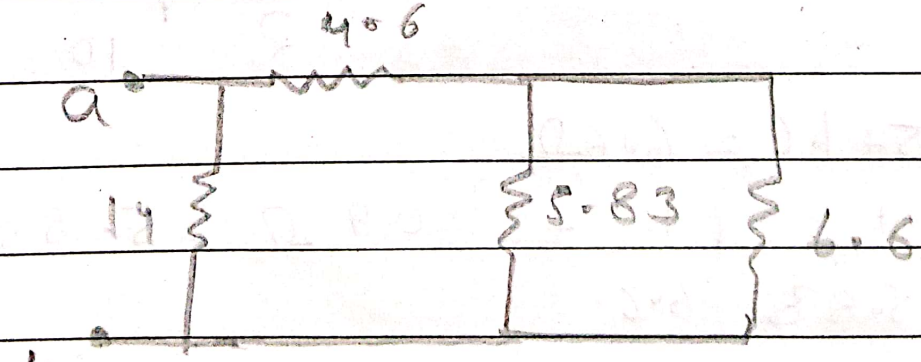
$$Rad \Rightarrow 6+6+\frac{6\times 6}{4} = 21\Omega$$

$$Rac \Rightarrow 6+4+\frac{6\times 4}{6} = 14\Omega = Rdc$$





(a)



(c)

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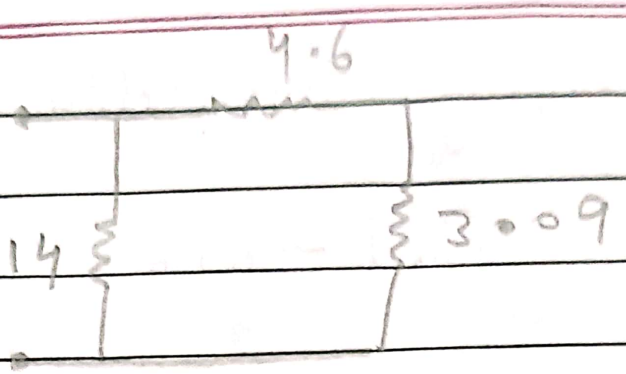
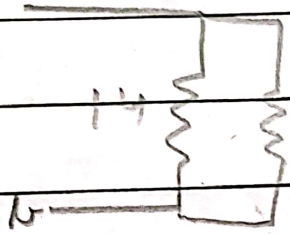


(d)



(e)

in fig (a) $\Rightarrow \frac{1}{30} + \frac{1}{6} = \frac{30}{6} = 5\Omega$

$\frac{1}{6} + \frac{1}{21} = \frac{42}{9} = 4.6\Omega$

$\frac{1}{14} + \frac{1}{10} = \frac{70}{12} = 5.83\Omega$

Now,

$\frac{1}{2} + \frac{1}{10} = \frac{10}{6} = 1.6\Omega$

) $5 + 1.6 = 6.6\Omega$

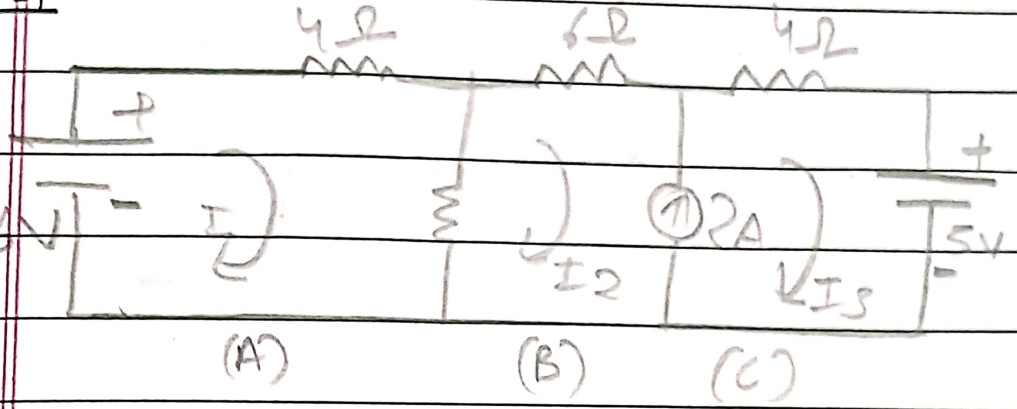
c) $\frac{1}{5.83} + \frac{1}{6.6} = 3.09\Omega \; (5.83 \,||\, 6.6)$

) $4.6 + 3.09 = 7.69 \; (4.6 - 3.04)$

e) $\frac{14 \times 7.69}{14+7.69} \Rightarrow 4.96 \approx 5\Omega$

$(14 \| 7.69)$

Ans 9



In mesh A $\rightarrow -4I_1 - 5(I_1 - I_2) + 6 = 0$

mesh B $\rightarrow -6I_2 - 5(I_2 - I_1) = 0$

mesh C $\rightarrow -4I_3 - 5V = 0$

$-6I_2 - 5I_2 + 5I_1 = 0$

$11I_2 = 5I_1 \quad I_2 = \frac{5}{11} I_1$

mesh A $\rightarrow -4I_1 - 5I_1 + 5I_2 + 6 = 0$

$-9I_1 + 5I_2 + 6 = 0$

$-9I_1 + 2.25I_2 + 6 = 0$

$6.75I_1 + 6 = 0$

$I_1 = \frac{-6}{6.75} \quad I_1 = -0.88$

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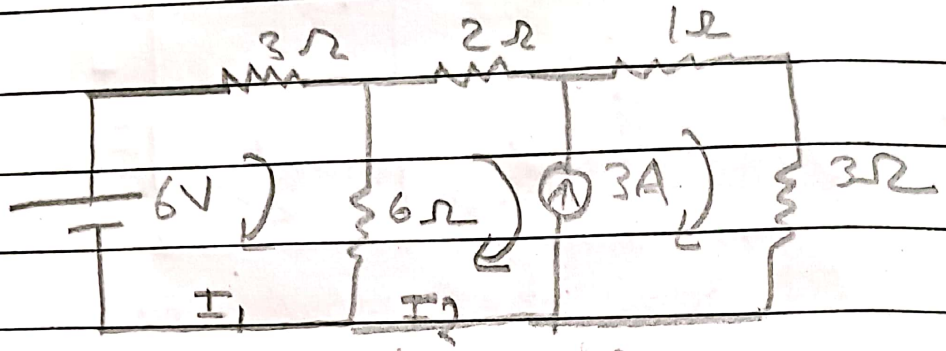
$0.45 \times 0.88 = I_2$ $\therefore I_2 = -0.39$

Current through

$I_2 \rightarrow \left(\frac{0.75 - (-0.39)}{-11.14}\right)$



$I_2 = 3A = I_3$

for Mesh 1 $\rightarrow -3I_1 - 6(I_1 - I_2) + 6 = 0$

$-3I_1 - 6I_1 + 6I_2 + 6 = 0$

$-9I_1 + 6I_2 + 6 = 0$

$\boxed{6 = 9I_1 - 6I_2}$ -①

mesh 2 $\rightarrow$

$-6(I_2 - I_1) - 2I_2 = 0$

$-6I_2 + 6I_1 - 2I_2 = 0$ $6I_1 = I_2$

$I_1 = \frac{4}{3} I_2$

$6 = 9\left(\frac{4}{3} I_3\right) - 6I_2$

$6 = 12 I_2 - 6I_2$

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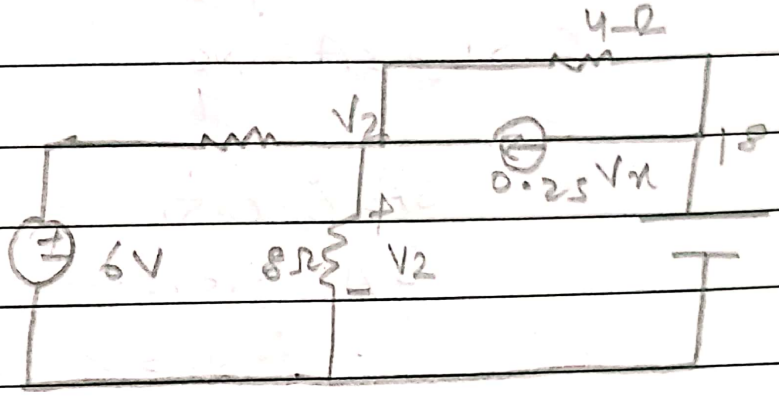
$6 = 6I_2 \quad \therefore \boxed{I_2 = 1}$

$1 + 3 = I_3 \quad \therefore I_3 = 4A$

Now,

$I_2 = 4 - \left(\frac{4 \times 3}{4}\right) \therefore 4 - 3 = \boxed{1A}$ (Ans)

(2)



$\frac{V_x - 18}{4} + \frac{V_x}{2} + \frac{V_x - 6}{2}$

$-0.25V_x = 0$

$\frac{V_x - 18}{4} = \frac{-V_x + 6 - V_x}{2} + 0.25V_x$

$\frac{V_x - 18}{2x} = \frac{-V_x + 6 - V_x + 0.5V_x}{x}$

$\frac{V_x - 18}{2} = \frac{-2V_x + 0.5V_x + 6}{1}$

$\frac{V_x - 18}{2} = -1.5V_x + 6$

$V_x - 18 = -3V_x + 12$

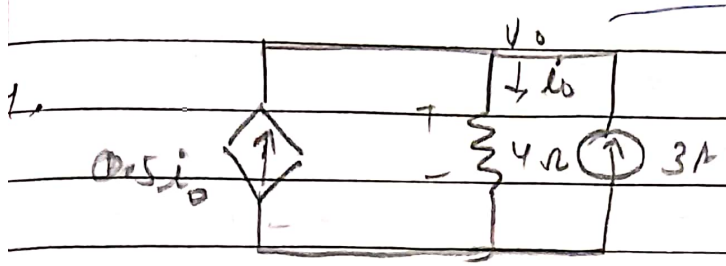
$4V_x = 30$

$V_x = 7.5\,V$

$$\frac{V_x - 18}{2} = -1.5V_x + 6$$

$$V_x - 18 = -3V_x + 12$$

$$4V_x = 30 \quad \therefore V_x = 7.5\ V$$



$$i_o = \frac{V_o - 0}{4}$$

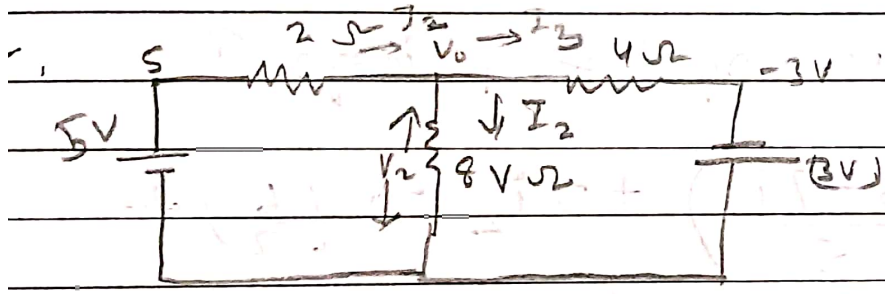
Now, Incoming current = outgoing current

$$0.5\,i_o + 3A = \frac{V_o}{4} = i_o$$

$$3A = i_o - 0.5\,i_o$$

$$3A = 0.5\,i_o \quad \therefore i_o = 6A$$

$$\therefore V_o = 6 \times 4 = 24V.$$



By fig $\rightarrow I_1 = I_2 + I_3$

$$\frac{5 - V_o}{2} = \frac{V_o - 0}{8} + \left(\frac{2V_o + 6V}{8}\right)$$

$$\frac{5 - V_o}{2} = \frac{V_o}{8} + \frac{2V_o + 6}{8}$$

$$\frac{5 - V_o}{2} = \frac{V_o + 2V_o + 6}{8}$$

$$4(5 - V_o) = 3V_o + 6 \Rightarrow 20 - 4V_o = 3V_o + 6$$

$$14 = 7V_o \quad \boxed{V_o = 2}$$

$$I_1 = \frac{5 - 2}{2} = \frac{3}{2} = 1.5A, \quad V_1 = 1.5 \times 2 = 3V.$$

$$I_2 = \frac{2}{8} = \frac{1}{4} = 0.25A, \quad V_2 = 8 \times 0.25 = 2V.$$

$$I_3 = \frac{2 + 3}{4} = \frac{5}{4} = 1.25A, \quad V_3 = 4 \times 1.25 = 5V.$$

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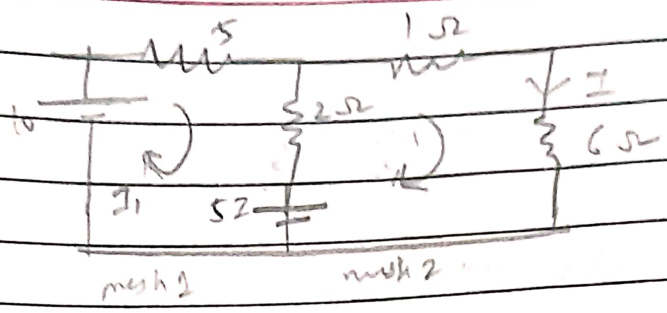
Ans 17:



for mesh 1:

$10 - 5(I_1) - 2(I_1 - I_2) - 5I = 0$

$10 - 7I_1 + 2I_2 - 5I = 0$

mesh 2 → $-1i_2 - 6i_2 + 5i_1 - 2(I_2 - I_1) = 0$

$-9i_2 + 2i_1 + 5I = 0$ — (2)

Adding eqn (1) & (2)

$10 - 7i_1 + 2i_2 - 5I - 9i_2 + 2i_1 + 5I_1 = 0$

$10 - 5i_1 - 7i_2 = 0$

$\Rightarrow \boxed{\frac{10 - 7i_2}{5} = i_1}$ now $\boxed{I_1 = I_2 \times \left(\frac{6}{7}\right)}$

Putting value of I & I_1 in eqn (1)

$10 - 7\left(\frac{10 - 7i_2}{5}\right) + 2i_2 - 5\left(\frac{6}{7}\right)i_2 = 0$

$\frac{35(10) - 7(70 - 49i_2) + 10i_2 - 150i_2}{35}$

$350 - 490 + 343i_2 + 10i_2 - 150i_2 = 0$

$140 = 263i_2$ $\quad i_2 = \frac{140}{263} = 0.532$

$\Rightarrow 10 - 5i_1 - 7i_2$

Putting the value of i_2 in this eqn

$10 - 5i_1 - 7(0.532)$

$10 - 5i_1 - 3.71 = 0$

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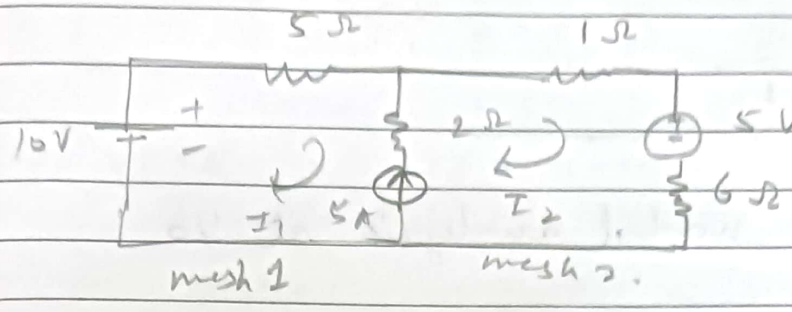
$-5i_1 = -6.29 \therefore i_1 = 6.27/5 = \boxed{1.25}$

Ans 18:



→ In mesh 1.

$10V - 5i_1 + 2(i_1 - i_2) = 0$

$10 - 5i_1 - 2i_1 + 2i_2 = 0$

$10 - 7i_1 + 2i_2 = 0$ — (1)

→ mesh 2

$1i_2 - 5 - 6i_2 - 2(i_2 - i_1) = 0$

$i_2 - 5 - 6i_2 - 2i_2 + 2i_1 = 0$

$-5 - 7i_2 + 2i_1 = 0$

$-(5 + 7i_2) = 2(i_1) \Rightarrow \frac{5 + 7i_2}{2} = i_1$

$10 - 7\left(\frac{5 + 7i_2}{2}\right) + 2i_2 = 0$

$10 - \left(\frac{35 + 49i_2}{2}\right) + 2i_2 = 0$

$20 - 35 - 49i_2 + 4i_2 = 0$

$-15 - 45i_2 = 0$

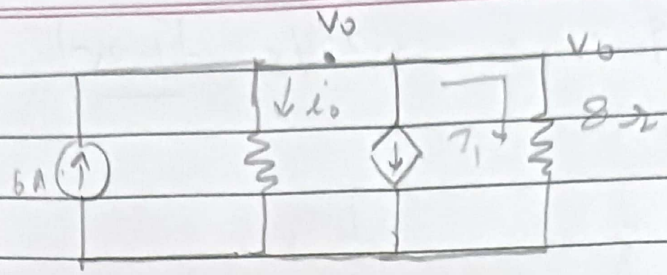
$-15 = 45i_2$

$i_2 = \frac{-1}{3} \quad \therefore \boxed{i_2 = -0.33}$

$i_1 = \frac{5 + 7(-0.33)}{2} = 5 - \frac{2.31}{2} = 1.34$

Now current flows through 1Ω.

Ans 19)



applying nodal analysis at V_o

$$6 = i_o + i_o/4 + i_1 \quad -(1)$$

$$6 = \frac{4i_o}{4} + \frac{i_o}{1} + \frac{V_o}{8} = \frac{5i_o}{4} + \frac{V_o}{8}$$

$$48 = 10i_o + V_o \quad -(2) \text{ now,}$$

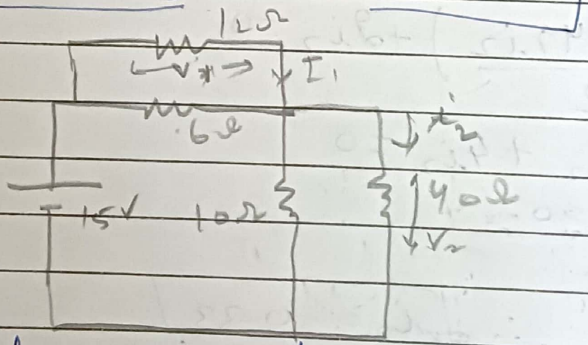
as in parallel voltage remains same,

$\therefore V_o$ is the potential diff. b/w 2Ω

$$\therefore i_o = \frac{V_o}{2}$$

$$48 = 10\left(\frac{V_o}{2}\right) + V_o \Rightarrow 48 = 6V_o$$

$$\boxed{V_o = 8V} \quad \therefore \boxed{i_o = 4A}$$

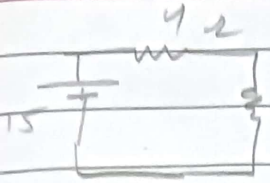


Solving 6Ω & 12Ω in parallel

$$\frac{1}{6} + \frac{1}{12} = \frac{12}{3} = 4\Omega$$

similarly solving 10Ω & 40Ω in parallel

$$\frac{1}{10} + \frac{1}{40} = \frac{40}{5} = 8\Omega$$



Now as 8Ω & 4Ω are in series.

$8+4 = 12\ \Omega$

$\therefore V = IR \qquad 15 = x \times 12 \qquad \therefore x = I = \frac{15}{12}$

$\therefore I = 1.25$

as current in series remains same.

$\therefore I_{4\Omega} = I_{8\Omega} = 1.25$

Now applying current dividing Rule in 12Ω & 6Ω

$1.25 \times \frac{8}{I_{8_3}} = 1.25 \times 0.33 \approx 0.41$

C.D.R. (Current division Rule) in 10Ω & 40Ω.

$1.25 \times \frac{40}{50} = 0.25\,A$

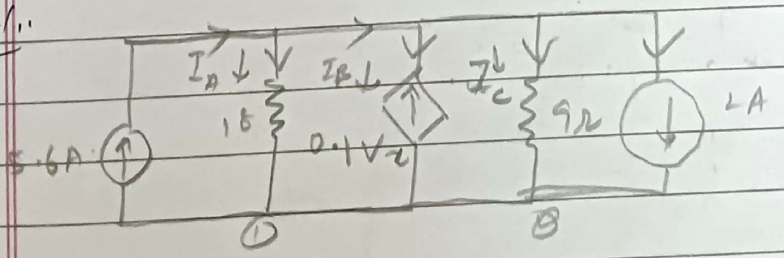
Now $V_{12\Omega} = 0.41 \times 12 = 4.92V$

$V_{40} = 0.25 \times 40 = 10V.$

Now $P_{12} = VI = 0.41 \times 4.92 = 2.012\ J$

$P_{40} = VI = 10 \times 0.25 = 25\ W.$

Ans 2)



$\frac{+5.6}{0.1V_x} = \frac{V_x}{18} + \frac{V_x}{9} + 2$

$\Rightarrow 0.1V_x + 5.6 = \frac{V_x + 2V_x + 5}{18}$

$(0.1V_x + 5.6)18 = 3V_x + 36$

$1.8V_x + 100.8 = 3V_x + 36$

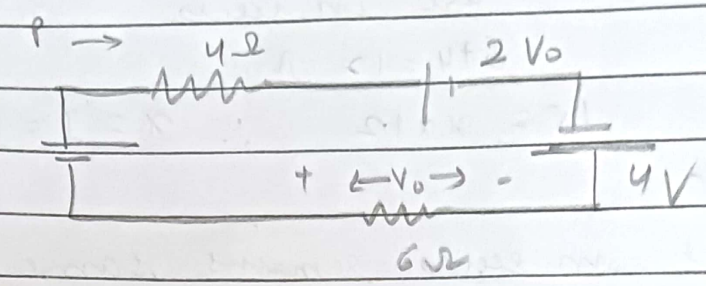
$100.8 - 36 = 1.2V_x \Rightarrow 64.8 = 1.2V_x$

$\frac{64.8}{1.2} = V_x \qquad \therefore V_x = 54$

$i_A = \frac{54}{18} = 3A \qquad i_B = 0.1 \times 54 = 5.4A.$

$i_{sc} = \frac{54}{9} = 6A$

Ans 22:



Applying KVL.

$-4i - 2V_0 + 4V + 12V - 6i = 0$

now as $6I = V_0 \therefore I = \frac{V_0}{6}$

$-10i - 2V_0 + 16V = 0$

$-10\left(\frac{V_0}{6}\right) - 2V_0 = -16$

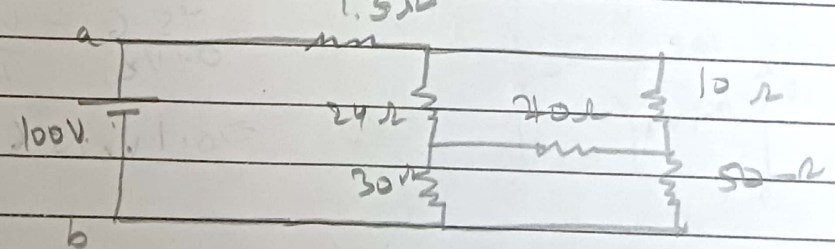
$\therefore -1.66V_0 - 2V_0 = -16$

$\therefore -3.66V_0 = -16 \Rightarrow V_0 = \frac{16}{3.66}$

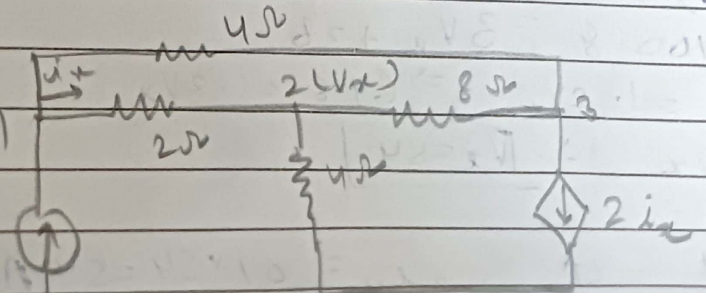
$\boxed{V_0 = 4.37}$ Ans.

Now, $P = \frac{4.37}{6} = 0.72A$

Ans 23:



Ans 24:



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for node 1

$$9 = \frac{V_1 - V_2}{2} + \frac{V_1 - V_3}{4} \quad -(1)$$

node 2

$$\frac{V_1 - V_2}{2} + \frac{V_1 - V_3}{4} = \frac{V_2}{4} + \frac{V_2 - V_3}{8} \quad -(2)$$

node-3

$$\rightarrow \frac{V_2 - V_3}{8} + \frac{V_1 - V_3}{4} = 2\left(\frac{V_1 - V_2}{2}\right)$$

Solving eqn (1), (2) & (3)

$$3V_1 - 2V_2 - V_3 = 8 \quad -(4)$$

$$6V_1 - 7V_2 - V_3 = 0 \quad -(5)$$

$$9V_2 - 3V_3 - 6V_1 = 0 \quad -(6)$$

now adding eqn (5) & (6)

$$9V_2 - 3V_3 - 6V_1 + 6V_1 - 7V_2 - V_3 = 0$$

$$\boxed{V_2 = 2V_3}$$

Subtracting eqn (4) from (5)

$$6V_1 - 7V_2 - V_3 - (3V_1 - 2V_2 - V_3 - 8) = 0$$

$$\boxed{V_2 = \frac{3V_1 + 8}{5}} \rightarrow \text{subs. value of } V_2 \text{ in eqn 6}$$

$$9V_2 - 3\left(\frac{V_2}{2}\right) - 6\left(\frac{5V_2 - 8}{3}\right) = 0$$

$$V_2\left(-1 - \frac{3}{2}\right) + 16 = 0 \qquad 5V_2 = 32$$

$$\boxed{V_2 = 6.4}$$

$$\therefore V_1 = \frac{5(6.4)}{3} - 8 = 8.$$

$$V_3 = \frac{6.4}{2} = 3.2 \qquad \text{now } V_1 = 6.4 - 8 = \boxed{1.6\ V}$$

same at V_3 (1.6) (as in || voltage remains same)

at 2 $\rightarrow$ 6.4 - 3.2 = $\boxed{3.2}$

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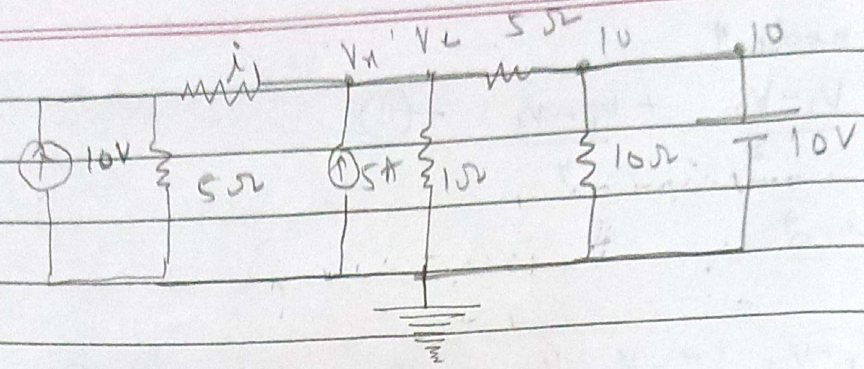
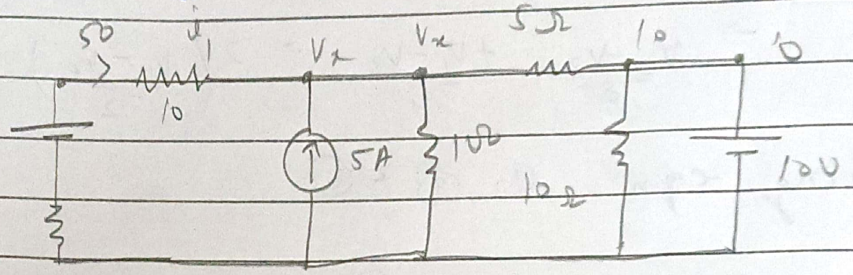
Ans 26.



Converting 10A source into voltage source



using KVL across V_x

$$\frac{50 - V_x}{10} + 5 = \frac{V_x}{1} + \frac{V_x - 10}{5}$$

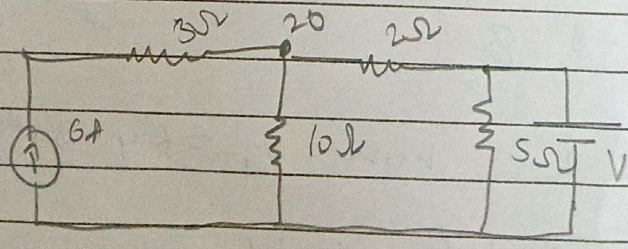
$$\frac{50 - V_x + 50}{10} = \frac{5V_x + V_x - 10}{5}$$

$$100 - V_x = 12V_x - 20 \Rightarrow \frac{120}{13} = V_x$$

$$V_x = 9.23 \quad \therefore i_1 = \frac{50 - 9.33}{10}$$

$$\Rightarrow \frac{40.77}{10} = 4.07 \Rightarrow \boxed{4A}$$

Ans 27.



Applying KVL at node

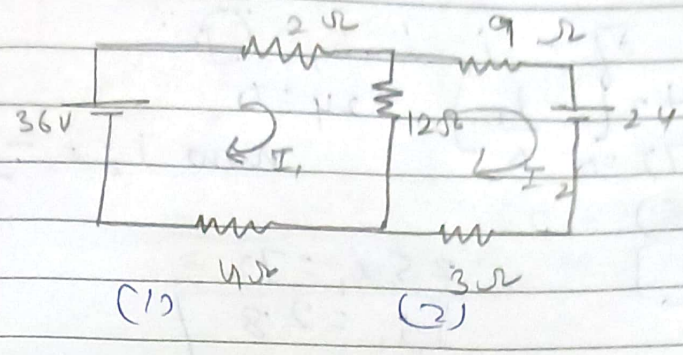
$$\frac{20 - V}{2} = \frac{V}{5}$$

$$\Rightarrow 100 - 5V = 2V$$

$$100 = 7V.$$

$$\therefore \boxed{V = 14.28}$$

∴ I through 5Ω = $\frac{14.28}{5}$ = 2.85 A



In mesh 1 → $-2i_1 - 12(i_1 - i_2) - 4i + 36 = 0$

$\Rightarrow -2i_1 - 12i_1 - 12i_2 - 4i_1 + 36 = 0$

$-18i_1 - 12i_2 + 36$ — (1)

mesh (2) → $-9i_2 - 24 - 3i_2 + 12(i_2 - i_1) = 0$

$-9i_2 - 3i_2 + 12i_2 + 12i_1 = 24 = 0$

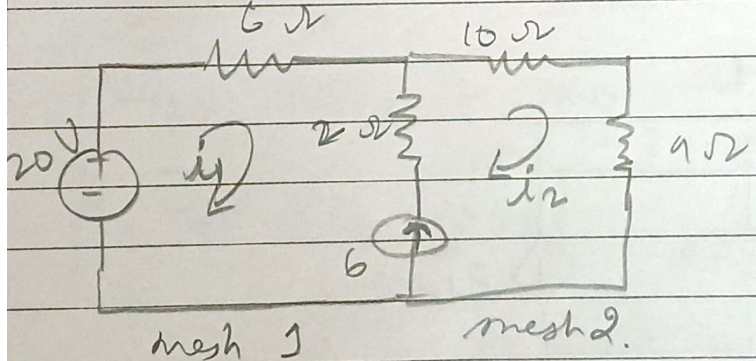
$-24i_2 + 12i_1 = 24$

$-2i_2 + i_1 = 2 \quad \therefore i_1 = 2 + 2i_2$

$-18(2 + 2i_2) - 12i_2 + 36 = 0$

$-36 - 36i_2 - 12i_2 + 36 = 0$

$i_2 = 0A$ $\quad$ $i_1 = 2A$



$6 + I_1 = I_2$

for mesh 1 :→ $-6i_1 - 2(i_1 - i_2) + 24 = 0$

$-6i_1 - 2i_1 + 2i_2 + 24 = 0$

$-8i_1 + 2i_2 + 24 = 0$ — (1)

$-6i_1 = -36 \quad \therefore i_1 = 6$

mesh 2 = $-6i_1 - 4i_2 + 2(i_2 - i_1) = 0$

$-14i_2 + 2i_2 - 2i_1 = 0$ — (2)

$-12 i_2 = 2 i_1$ $\quad \therefore \boxed{i_1 = -6 i_2}$

Putting value of i_1 in eqn (1)

$\rightarrow 0 \quad -8 i_1 + 2\left(-\frac{i_1}{6}\right) + 24 = 0$

$-24 i_1 - i_1 + 72 = 0$ $\quad$ now $i_2 = -\frac{i_1}{6}$

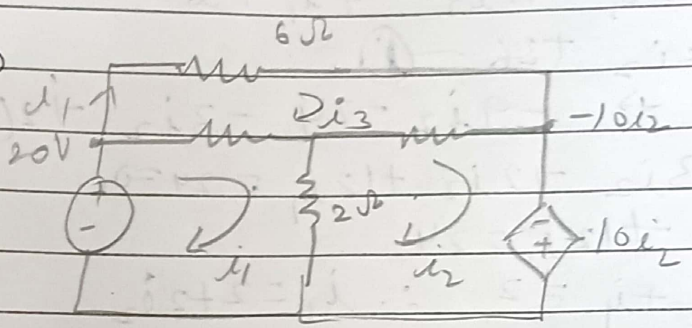
$i_2 = -(6 - 28)$

$= \boxed{-3.2A}$

$25 i_1 = 72$

$\boxed{i_1 = 2.8}$

Ans 29. (2)

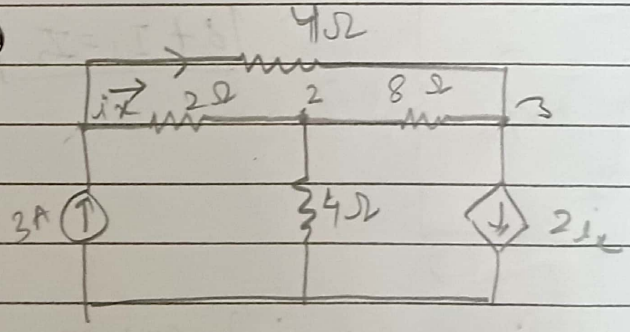


$i_0 = \frac{20 + 10 i_2}{6}$ $\quad 6 i_0 - 10 i_0 = 20$

$-4 i_0 = 20$

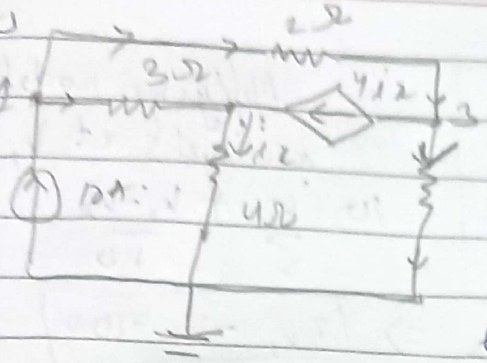
$\boxed{i_0 = 5A}$

Ans 30. (1)



At node 1 : $\quad 3 = \frac{V_1 - V_2}{2} + \frac{V_1 - V_3}{4}$

Ans 30 Ω



node 1.

$$10 = \frac{V_1 - V_2}{3} + \frac{V_1 - V_3}{2}$$

$$60 = 5V_1 - 2V_2 - 3V_3 \quad -(1)$$

node (3) $= \frac{V_1 - V_3}{2} - V_2 = \frac{V_3}{6}$

node 2

$$\frac{V_1 - V_2}{3} = \frac{V_2}{4} - 4\left(\frac{V_2}{4}\right)$$

$\hookrightarrow i_x$

$$\Rightarrow 4V_1 + 5V_2 = 0$$

$$\boxed{\frac{4V_1}{5} = V_2} \quad -(2)$$

$$3V_1 - 4V_3 - 6V_2 = 0 \quad -(3)$$

$$(5V_1 - 3V_3 - 2V_2 - 60 = 0) \times 3$$

$$3V_1 - 4V_3 - 6V_2 = 0$$

$$3V_1 - 4V_3 - 6V_2$$

$$15V_1 - 9V_3 - 6V_2 - 180$$

$$-12V_1 + 5V_3 = -180$$

$$\boxed{V_3 = \frac{-180 + 12V_1}{5}}$$

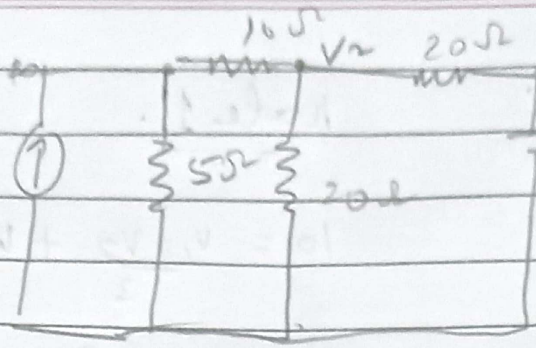
Putting value of V_2 & V_3 in eq (1).

$$60 = 5V_1 - 2\left(\frac{-4V_1}{5}\right) - 3\left(\frac{-180 + 12V_1}{5}\right)$$

$$300 = 25V_1 + 8V_1 - 36V_1 + 540$$

$$\therefore \boxed{V_1 = 80} \quad \boxed{V_2 = -64} \quad \boxed{V_3 = 156}$$

Ans 31



Applying nodal analysis at V_1.

$$10 = \frac{V_1}{5} + \frac{V_1 - V_2}{10}$$

$$100 = 2V_1 + V_1 - V_2 \Rightarrow \boxed{3V_1 - V_2 = 100}$$

• nodal analysis at V_2 $\boxed{3V_1 - 100 = V_2}$

$$\frac{V_1 - V_2}{10} = \frac{V_2 + 100}{30} + \frac{V_2}{20}$$

$$6(V_1 - V_2) = 2(V_2 - 100) + 3V_2$$

$$\Rightarrow 6V_1 - 6V_2 = 2V_2 - 200 + 3V_2$$

$$6V_1 - 6V_2 = 5V_2 - 200$$

$$6V_1 + 200 = 11V_2$$

$$6V_1 + 200 = 11(3V_1 + 100)$$

$$6V_1 + 200 = 33V_1 - 1100$$

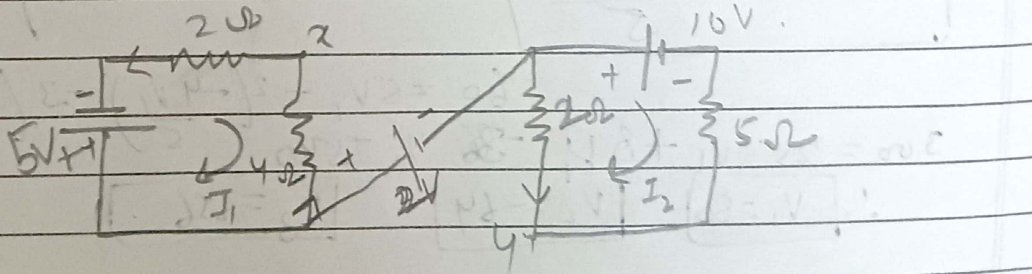
$$1300 = 27V_1$$

$$\boxed{V_1 = 48.14} \qquad \boxed{V_2 = 44.42}$$

$$\therefore I_1 = \frac{V_1 - V_2}{10} = \frac{48.14 - 44.42}{10} = \boxed{0.372}$$

$$I_2 = \frac{V_2 - 100}{30} = \frac{44.42 - 100}{30} = \boxed{-1.85A}$$

Ans 32.



for $I_1 = \frac{5}{2+4} = \frac{5}{6} = 0.833A$.

$I_2 = \frac{10}{7} = 1.428\ A.$

Now voltage drop across x & y

$V_x + 4 \times 0.83 - 2 - 2 \times 1.48 = V_y$

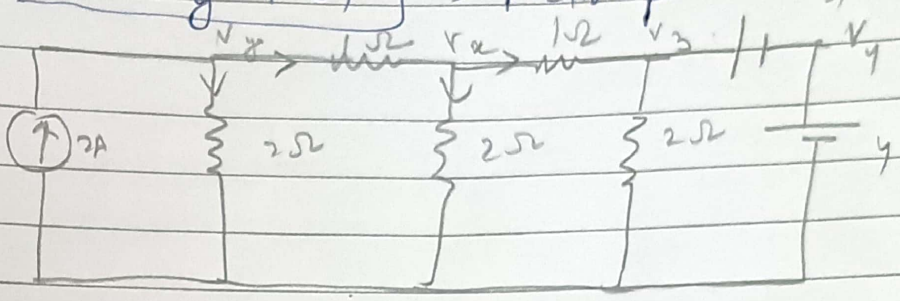
(+ve as we are crossing the resistance in opp. dirⁿ of current)

$V_x + 3.32 - 2 - 2.96 = V_y$

$V_x + 3.32 - 4.96 = V_y$

$\boxed{V_x - V_y = 1.64} \rightarrow$ P. drop.

Ans 33.



At $V_y \Rightarrow 2 = \frac{V_y}{2} + \frac{V_y - V_x}{1}$

$4 = 3V_y - 2V_x \quad -(1)$

at $V_x \Rightarrow \frac{V_y - V_x}{1} = \frac{V_x + 4}{1} + \frac{V_x}{2}$

$= 2V_y - 5V_x + 4 = 0 \quad -(2)$

$\frac{4 - 3V_y}{-2} = V_x$

$\rightarrow 2V_y - 5\left(\frac{4 - 3V_y}{-2}\right) + 4 = 0$

$2V_y + 5\left(\frac{4 - 3V_y}{2}\right) + 4 = 0$

$2V_y + 20 - \frac{15V_y}{2} + 4 = 0$

$4V_y + 20 - 15V_y + 8 = 0$

$-11V_y = -28$

$\therefore V_y = 2.54$

$\boxed{V_y = 2.54}$

$\therefore V_x = \frac{4 - 3V_y}{2} = \frac{4 - 7.62}{2} = V_x$

$\therefore \boxed{V_x = 1.81}$

$\therefore V_1 = 2.54, V_2 = 1.81$

$V_3 = 2.$

$V_y = 4 - 2 = 2V$