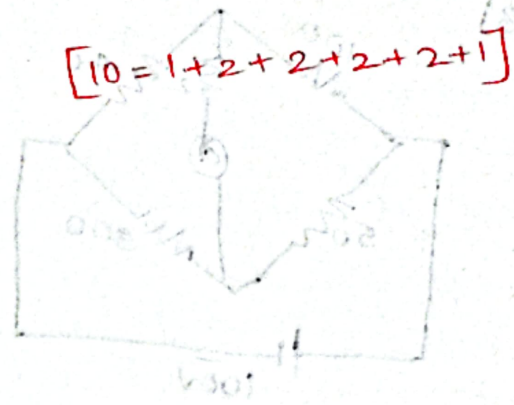
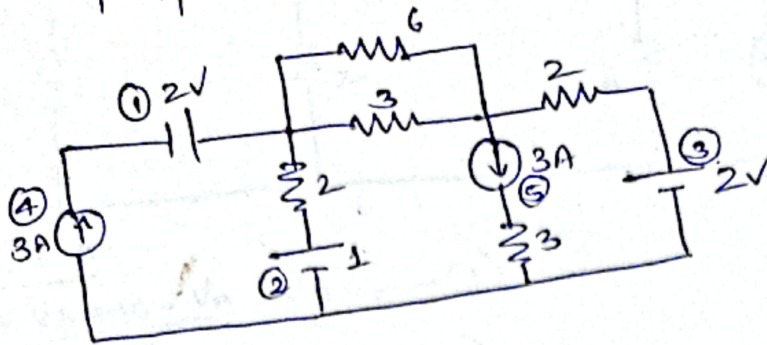


## Q1] Superposition.



(i) For 2V

Redraw the ckt  
 $I = 0$ .

$$\left[ \begin{array}{l} \text{---} (1/2) \\ \text{---} (1/2) \end{array} \right] (1)$$

(ii) For 1V

Redraw the ckt.  
 $I = 0.11A$ .

$$\left[ \begin{array}{l} \text{---} (1) \\ \text{---} (1) \end{array} \right] (2)$$

(iii) For 2V

Redraw the ckt  
 $I = 0.22A$  [Opposite direction]

$$\left[ \begin{array}{l} \text{---} (1) \\ \text{---} (1) \end{array} \right] (2)$$

(iv) For 3A

Redraw the ckt  
 $I = 0.66A$

$$\left[ \begin{array}{l} \text{---} (1) \\ \text{---} (1) \end{array} \right] (2)$$

(v) For 3A

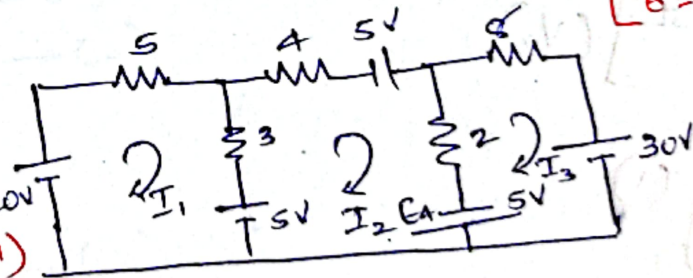
Redraw the ckt  
 $I = 0.66A$

$$\left[ \begin{array}{l} \text{---} (1) \\ \text{---} (1) \end{array} \right] (2)$$

Total current through  $3\Omega = 1.21A$ .

## Q2] Loop Equations.

$$\begin{aligned} 8I_1 - 3I_2 - 0I_3 &= 15 \quad \text{---} (1) \\ -3I_1 + 9I_2 - 2I_3 &= 15 \quad \text{---} (1) \\ 0I_1 - 2I_2 + 10I_3 &= -35 \quad \text{---} (1) \end{aligned}$$



$$[6 = 3 + 1 + 1 + 1]$$

$$I_1 = 2.55A$$

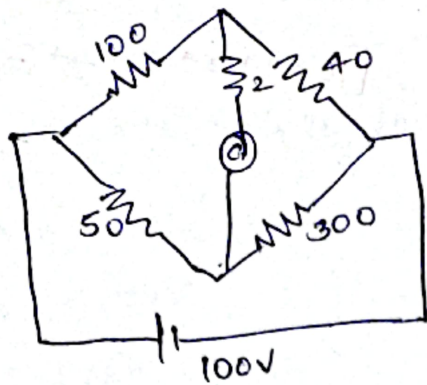
$$I_2 = 1.822A$$

$$I_3 = -3.13A \text{ [Opposite direction]}$$

$$I_{8\Omega} = 3.13A \quad \text{---} (1)$$

$E_4 = \text{Supplying power / giving power} \quad \text{---} (1)$

Q.3]



To find  $V_{TH}$ .

$I_1 = 0.714 \text{ A}$      $I_2 = 0.285 \text{ A}$     — (1)

$V_{TH} = 71.4 - 14 = 57 \text{ V}$     — (2)

To find  $R_{TH}$ .

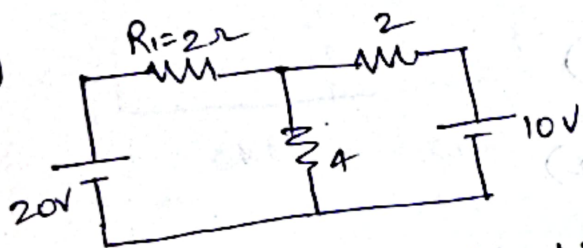
Circuit

$R_{TH} = (100 \parallel 40) + (50 \parallel 300)$     — (1)  
 $= 71.42 \Omega$     — (2)

Draw the Thevenin's circuit

$I_G = 0.77 \text{ A}$

Q.4]



For 20V

$R_{eq} = 3.33 \Omega$

$I = 6 \text{ A}$

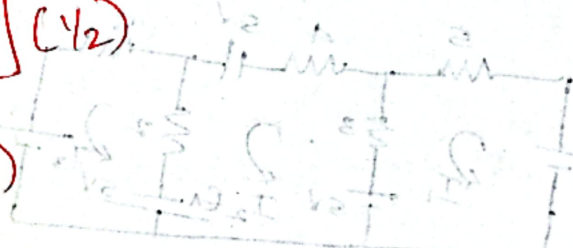
$I_{R1} = 6 \text{ A}$

$I_{R2} = 4 \text{ A}$

$I_{R3} = 2 \text{ A}$

Redraw the ckt.

(1/2)



For 10V

Redraw the circuit    — (1)  
 $R_{eq} = 3.33 \Omega$     (1/2)

$I = 3 \text{ A}$

$I_{R1} = 2 \text{ A}$

$I_{R2} = 3 \text{ A}$

$I_{R3} = 1 \text{ A}$

Total  $I_{R1} = 4 \text{ A}$     — (1)

$I_{R2} = 1 \text{ A}$     — (1)

$I_{R3} = 3 \text{ A}$     — (1)

$[8 = 3 + 3 + 2]$



$V_S = 10 \text{ V}$  (1)

Redraw the ckt.

$I = 0$

$V_S = 10 \text{ V}$  (2)

Redraw the ckt.

$I = 0$

$V_S = 10 \text{ V}$  (3)

Redraw the ckt.

$I = 0$

$V_S = 10 \text{ V}$  (4)

$[8 = 2 \frac{1}{2} + 2 \frac{1}{2} + 3]$

$I = 0$

$V_S = 10 \text{ V}$  (5)

Redraw the ckt.

$I = 0$

Redraw the ckt.

$I = 0$

$I = 0$

$I = 0$

$I = 0$

$I = 0$

$I = 0$

$I = 0$

$I = 0$

$I = 0$

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$I = 0$

$I = 0$

$I = 0$

$I = 0$

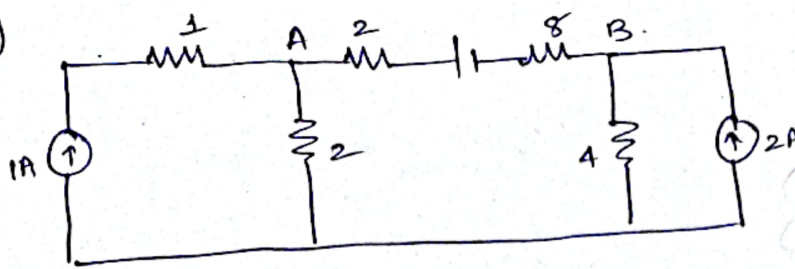
$I = 0$

$I = 0$

$I = 0$



Q5]



Node A

$$1 + \frac{V_B + 10 - V_A}{10} = \frac{V_A}{2} \quad (1)$$

$$6V_A - V_B = 20 \quad (2)$$

Node B

$$2 = \frac{V_B + 10 - V_A}{10} + \frac{V_B}{4} \quad (1)$$

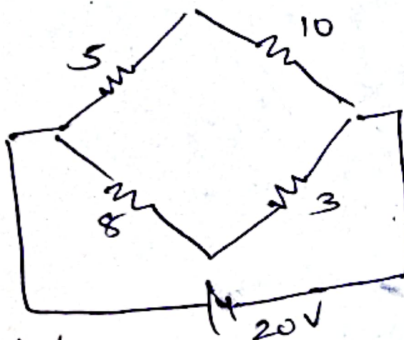
$$2V_A - 7V_B = -20 \quad (2)$$

$$\therefore V_A = 4V \quad (1)$$

$$V_B = 4V \quad (1)$$

$$[8 = 3 + 3 + 2]$$

Q6]



To find  $V_{TH}$

$$I_1 = 1.33A \quad I_2 = 1.81A \quad (1)$$

$$V_{TH} = 14.48 - 6.65 = 7.83V \quad (2)$$

To find  $R_{TH}$

Circuit (1)

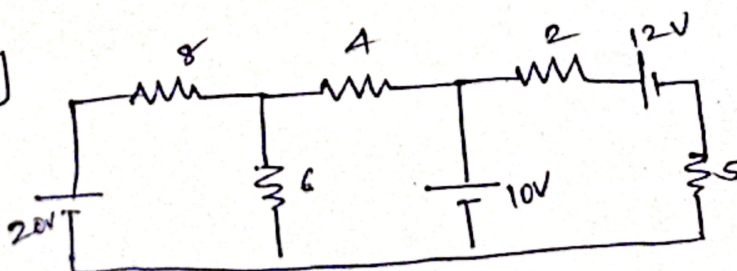
$$R_{TH} = (8 \parallel 3) + (5 \parallel 10) \quad (2)$$

$$= 5.51$$

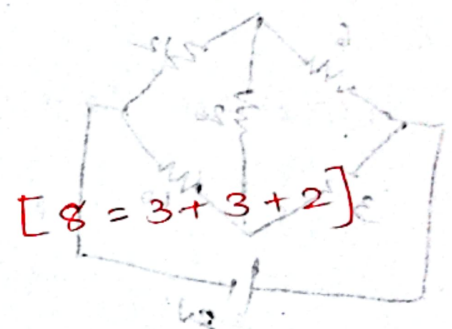
Draw the Thevenin circuit (1)

$$I = 1.04A \quad (1)$$

Q7]



$$[8 = 2 + 2 + 2 + 2]$$

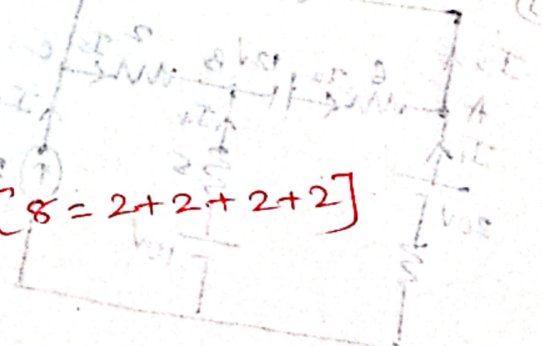


$$[8 = 3 + 3 + 2]$$

$$210 = 210 \quad 11.9 = 11.9$$

$$21.0 - 21.0 = 0 \quad 11.9 = 11.9$$

$$21.0 - 21.0 = 0 \quad 11.9 = 11.9$$



For 20V.

Redraw the circuit — (1)

$I = 0$  — (1)

For 10V

Redraw the circuit — (1)

$I = 1.43A$  — (1)

For 12V

Redraw the circuit — (1)

$I = 1.71A$  — (1)

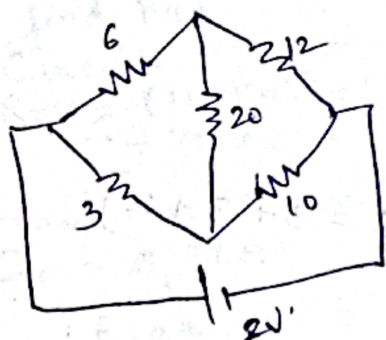
Total I.

$I_s = 0.284A$  — (2)



(1)  $\frac{10V}{2} = 5V$   
 (2)  $\frac{12V}{2} = 6V$   
 (3)  $\frac{20V}{2} = 10V$   
 Total  $V = 5V + 6V + 10V = 21V$   
 [7 = 2 + 3 + 2]

Q8]



To find  $V_{TH}$

$I_1 = 0.11$   $I_2 = 0.15$  — (1)

$V_{TH} = 0.66 - 0.44 = 0.22V$  — (1)

To find  $R_{TH}$

Circuit — (1)

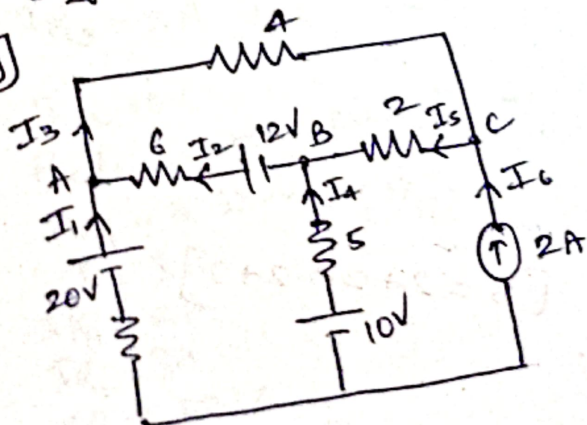
$R_{TH} = 6.3\Omega$  — (2)

Draw the Thevenins circuit — (1)

$I_{20} = 7.5mA$  — (1)



Q9]



— (1)





Node B = 12V =  $V_B$ . — (2)

Node A

$\frac{V_A - V_B}{6} = \frac{10 - V_A}{3} + \frac{16 - V_A}{8}$  — (1)

$15V_A - 4V_B = 128$  — (1)

$V_A = 11.73V$ . — (1)

$I_1 = 0.576A$

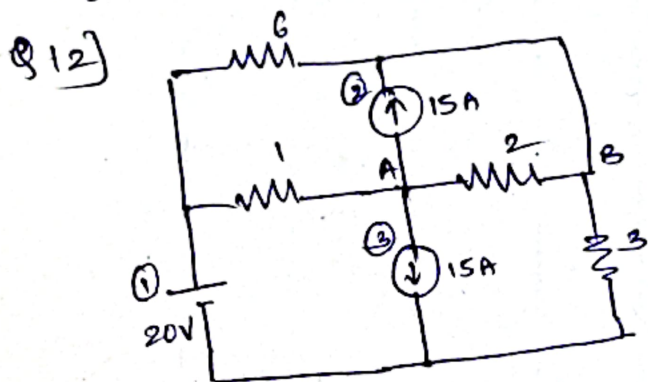
$I_2 = 0.533A$

$I_3 = -0.045A$

$I_4 = 1A$

$I_5 = 0.955A$

} (2)



For 20V ckt — (1)

$R_{eq} = 5\Omega$

$I = 4A$

$I_{2\Omega} = 2.66A$  — (1)

For 15A.

Draw the circuit — (1)

$I_{2\Omega} = 9A$  (Opposite direction) — (1 1/2)

For 15A.

Draw the circuit — (1)

$I_{2\Omega} = 3A$  (Opposite direction) — (1 1/2)

Total current.

$I_{2\Omega} = 9.34A$  (from B to A). — (1)

(1)  $\frac{10 - V_A}{3} + \frac{16 - V_A}{8} = \frac{V_A - 12}{6}$

(1)  $10 - V_A + \frac{16 - V_A}{2} = 2V_A - 12$

(1)  $10 - V_A + 8 - \frac{V_A}{2} = 2V_A - 12$

(1)  $18 - \frac{3V_A}{2} = 2V_A - 12$

(1)  $30 = \frac{7V_A}{2}$

(1)  $V_A = \frac{60}{7} = 8.57V$

(1)  $I_1 = \frac{10 - 8.57}{3} = 0.47A$

(1)  $I_2 = \frac{16 - 8.57}{8} = 0.93A$

(1)  $I_3 = \frac{8.57 - 12}{6} = -0.58A$

(1)  $I_4 = 1A$

(1)  $I_5 = 0.955A$

(1)  $I_{2\Omega} = 9.34A$

[8 = 2 + 2 1/2 + 2 1/2 + 1]

(1)  $10 - V_A + \frac{16 - V_A}{2} = 2V_A - 12$

(1)  $10 - V_A + 8 - \frac{V_A}{2} = 2V_A - 12$

(1)  $18 - \frac{3V_A}{2} = 2V_A - 12$

(1)  $30 = \frac{7V_A}{2}$

(1)  $V_A = \frac{60}{7} = 8.57V$

(1)  $I_1 = \frac{10 - 8.57}{3} = 0.47A$

(1)  $I_2 = \frac{16 - 8.57}{8} = 0.93A$

(1)  $I_3 = \frac{8.57 - 12}{6} = -0.58A$

(1)  $I_4 = 1A$

(1)  $I_5 = 0.955A$

(1)  $I_{2\Omega} = 9.34A$

Node A

$$\frac{V_A - V_C}{4} = \frac{20 - V_A}{6} + \frac{V_B + 12 - V_A}{6} \quad \text{--- (1/2)}$$

$$7V_A - 2V_B - 3V_C = 64 \quad \text{--- (1)}$$

Node B

$$\frac{V_B + 12 - V_A}{6} = \frac{10 - V_B}{5} + \frac{V_C - V_B}{2} \quad \text{--- (1/2)}$$

$$5V_A - 26V_B + 15V_C = 0 \quad \text{--- (1)}$$

Node C

$$\frac{V_C - V_B}{2} = 2 + \frac{V_A - V_C}{4} \quad \text{--- (1/2)}$$

$$V_A + 2V_B - 3V_C = -8 \quad \text{--- (1)}$$

$$V_A = 23.4V$$

$$V_B = 17.14V$$

$$V_C = 21.90V$$

} (1/2)

$$I_1 = -0.57A$$

$$I_2 = 0.95A$$

$$I_3 = 0.38A$$

$$I_4 = -1.428A$$

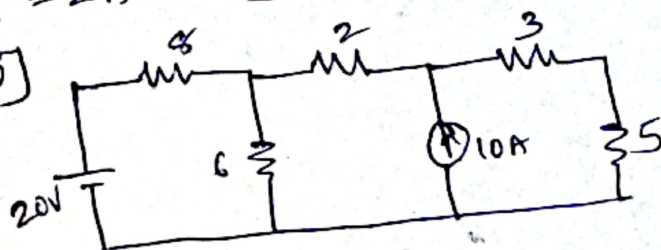
$$I_5 = 2.38A$$

$$I_6 = 2A$$

} (1)

} (1)

Q10]



$$[6 = 3 + 2 + 1]$$

for 20V ckt --- (1)

$$R_{eq} = 11.75$$

$$I = 1.70A$$

$$I_5 = 0.64A$$

} (1)

--- (1)

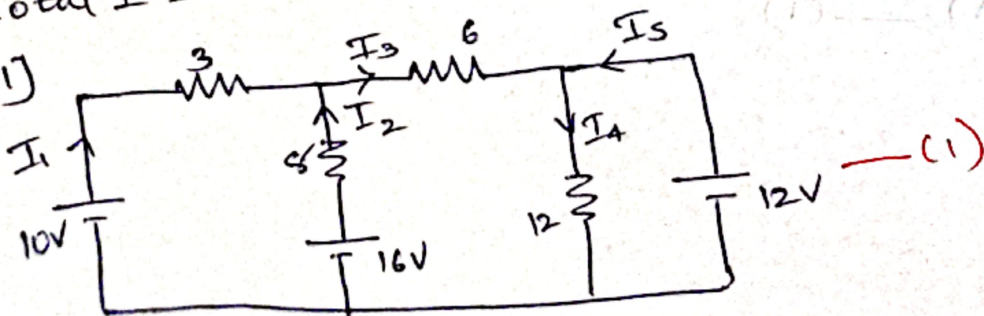
for 10A ckt --- (1)

$$I_6 = 4.045A$$

--- (1)

$$\text{Total } I = 4.6A \quad \text{--- (1)}$$

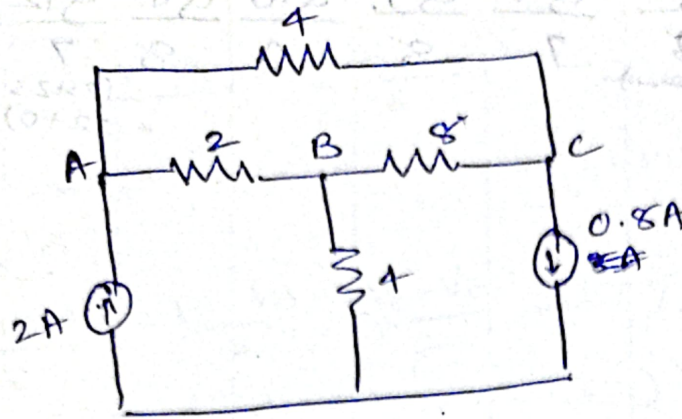
Q11]



$$[8 = 1 + 2 + 2 + 1 + 2]$$



Q. 13]



$$[7 = 2 + 2 + 2 + 1]$$

Node A

$$2 = \frac{V_A - V_B}{2} + \frac{V_A - V_C}{4} \quad \text{--- (1)}$$

$$8 = 3V_A - 2V_B - V_C \quad \text{--- (1)}$$

Node B

$$\frac{V_A - V_B}{2} = \frac{V_B}{4} + \frac{V_B - V_C}{8} \quad \text{--- (1)}$$

$$0 = -4V_A + 7V_B - V_C \quad \text{--- (1)}$$

Node C

$$0.8 = \frac{V_A - V_C}{4} + \frac{V_B - V_C}{8} \quad \text{--- (1)}$$

$$6.4 = 2V_A + V_B - 3V_C \quad \text{--- (1)}$$

$$\begin{aligned} \therefore V_A &= 7.314V \\ V_B &= 4.8V \\ V_C &= 4.34V \end{aligned}$$

} (1)