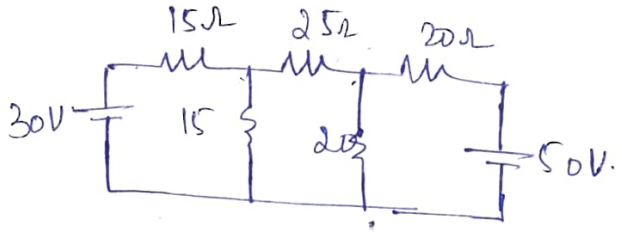


Nodal Analysis.

Steps to Solve

(1) Identify the Nodes. (No. of Nodes).

(2) Identify the Equivalent Nodes (In btw No V.S or C.S is present)

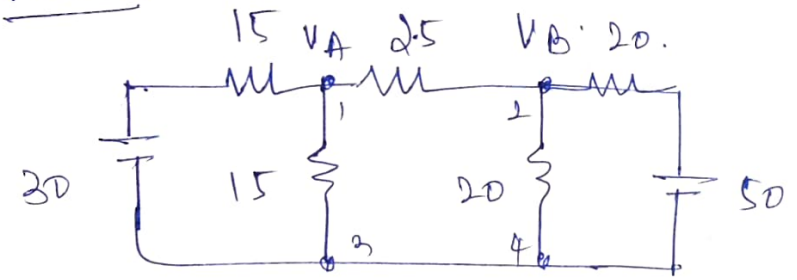
(3) ~~AP~~Identify the Ground Node.

(4) Apply the formula & Solve.

Formula = Jahase nikal raha hai − Jahase Jaraha hai +/− V

Resistance.

Problem

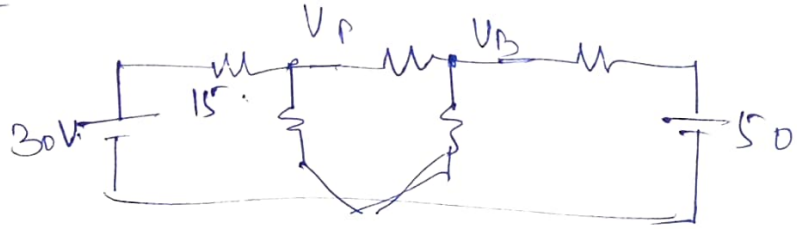


⇒ Find the Current flowing through VA & VB.

Step 1: Identify the No. of Nodes

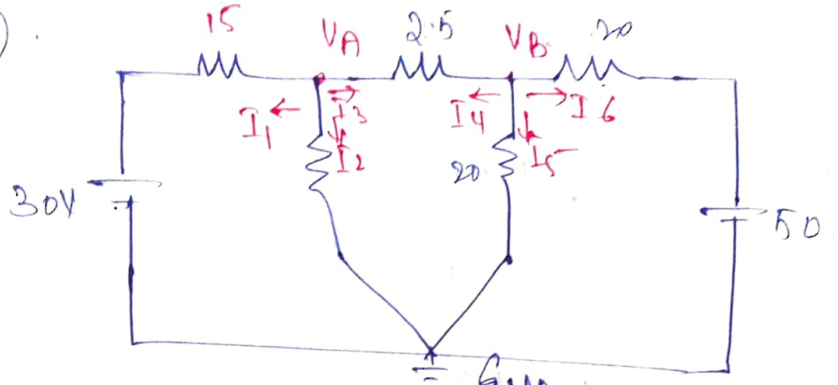
@ 1, 2, 3, 4 are Nodes.

Step 2: Identify the Equivalent Nodes.



(3) Identify GND = 0.

(4)



Applying kcl to V_A.

$$\frac{V_A - 30}{15} + \frac{V_A}{15} + \frac{V_A - V_B}{2.5} = 0.$$

$2.5 \times 6 = 15$

$$\Rightarrow \frac{V_A - 30 + V_A + 6V_A - 6V_B}{15} = 0.$$

$$\Rightarrow 8V_A - 6V_B - 30 = 0.$$

$$8V_A - 6V_B = 30. \quad \text{— Eq}^n \text{ (1)}.$$

(2) Applying kcl to V_B.

$$\frac{V_B - V_A}{2.5} + \frac{V_B}{20} + \frac{V_B - 50}{20} = 0.$$

$2.5 \times 8 = 20$

$$\frac{8V_B - 8V_A + V_B + V_B - 50}{20} = 0.$$

$$-8V_A + 10V_B = 50 \Rightarrow -8V_A + 10V_B = 50 \quad \text{— (2)}$$

$-8V_A + V_B = 50$

$8V_A - 6V_B = 30$

$-5V_B = 20$

$-V_B = \frac{20}{5}$ 4.

$V_B = -4$

$\frac{V_A - V_B}{2.5} = -0.5A(\rightarrow)$

Ans

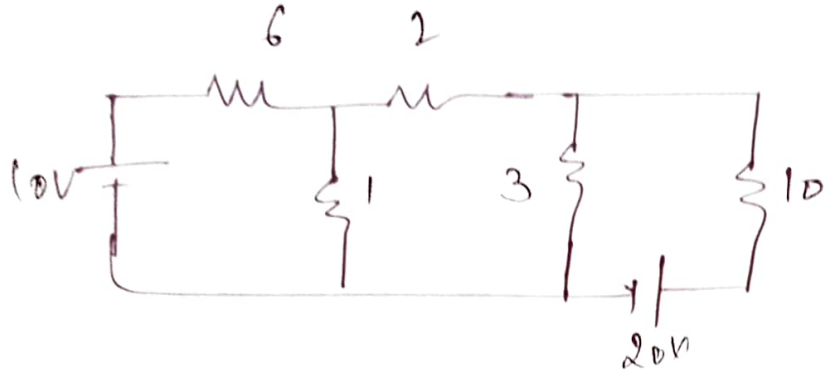
$18.75, 20$

$V_A = 18.75$;

$V_B = 20$.

Mesh Analysis

* Find the value of Current flowing through 2Ω resistor.



Step ① (No. of meshes / Boxes) — ③

(Each Mesh 'i' to be Calculated in clockwise or anti clockwise direction)

Formula Find 'I'

step ② Find 'i' by using form

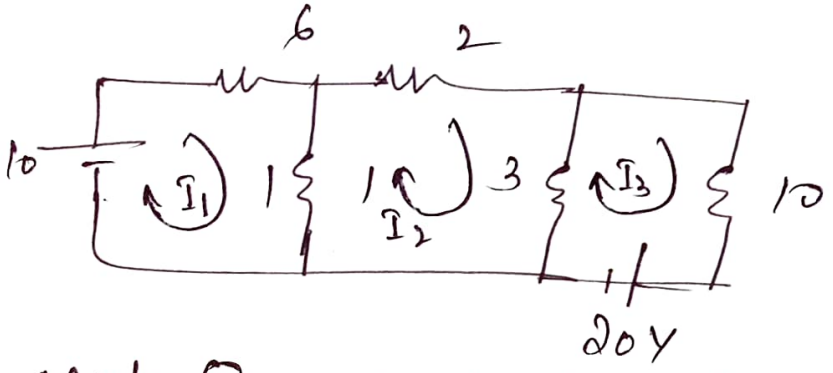
Step ③ Solve the Eqn.

No (bada - chota) = V.

↓

Bada - wo jisko hum gumna rahe he.

Chota - wo Jiske Saath bada Food Share kar rahe hai.



Mesh ① Apply KVL to Mesh 1

$$1(I_1 - I_2) + 6(I_1) = 10.$$

$$I_1 - I_2 + 6I_1 = 10$$

$$7I_1 - I_2 = 10 \quad - (1).$$

Apply KVL to mesh ②

$$1(I_2 - I_3) + 2I_2 + 3(I_2 - I_3) = 0.$$

$$I_2 - I_3 + 2I_2 + 3I_2 - 3I_3 = 0.$$

~~$6I_2 - 4I_3 = 0.$ — (2)~~

$$-I_1 + 6I_2 - 3I_3 = 0 \quad — (2).$$

Apply KVL to mesh ③

$$3(I_3 - I_2) + 10I_3 = -20$$

$$13I_3 - 3I_2 = -20.$$

$$-3I_2 + 13I_3 = -20 \quad — (3)$$

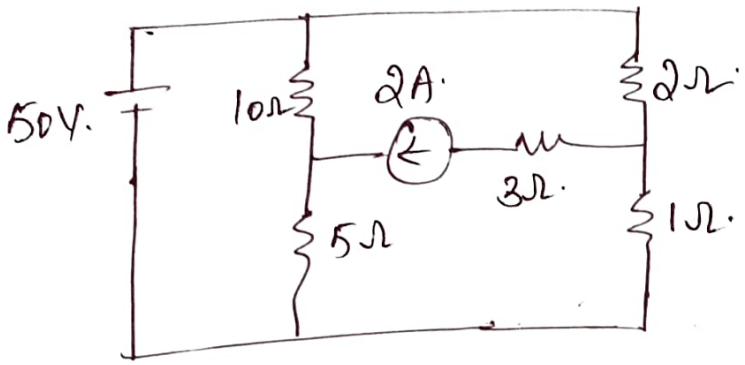
$I_1 = 1.34\,A$

$I_2 = -0.61\,A$

$I_3 = -1.68\,A$

Current through 2Ω Resistor is $-0.61\,\Omega$

* Super Mesh



Step 1: No. of Boxes/Meshes).

Step 2: Find I.

Step 3: Eqn (Solve by using Formula.

Formula

No(Bada - chota) = V.

Bada: wo jisko hum guna rahe hei.

Chota: wo Jiske saath bada food share kar raha hei.

N, T,

Thevenin's Theorem

Step 1: Calculate V_{Th}. by replacing load resistance with R_{Th}.

Solve ~~the~~ like Nodal Analysis

Nodal Analysis.

Step 1: Identify the Nodes. → (In b/w No V.S / C.S is present

Step 2: Identify the Equipotential Nodes

Step 3: Identify the GND Nodes.

Step 4: Using Formula Solve the proble

Jahase Current Nikal raha hei — Jahape Current Ja raha hei $\pm V$

Resistance.

Step 2 :- Calculate R_{Th}

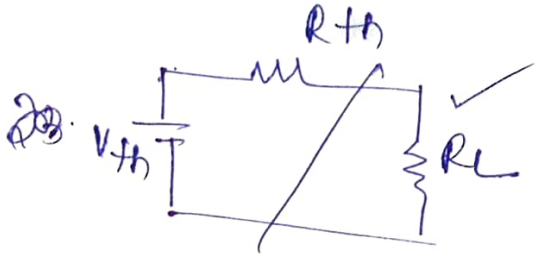
Replace Voltage Source with Short Circuit

Current Source with open Circuit.

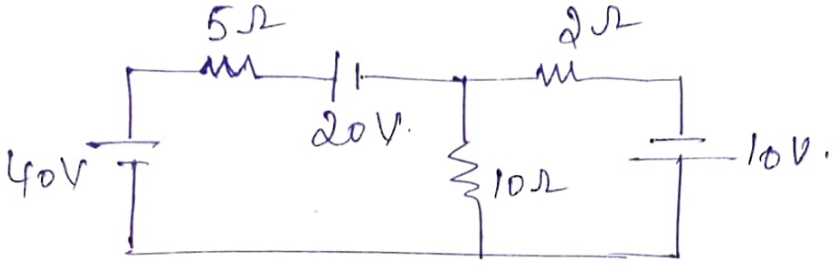
Solve using Series / parallel.

Step 3.

Calculate I_L.

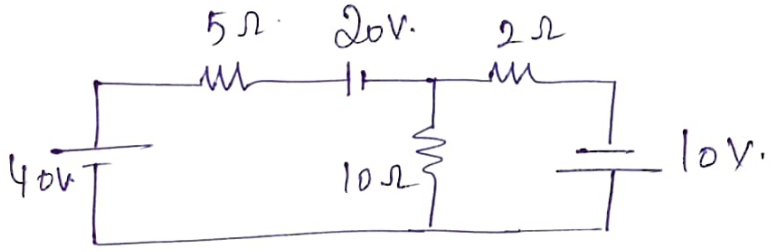


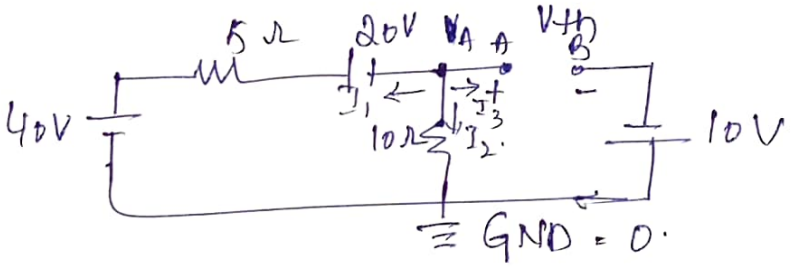
→ Find the value of Current flowing through 2Ω resistor. using Thevenin's theorem.



Step 1 Calculating V_{th}.

GND (More Branches)





V_{th} - is 0.C

$I_3 = 0$.

Apply kcl to V_A.

$$\frac{V_A - 0}{5} + \frac{20 - 40}{5} \Rightarrow \frac{V_A - 20}{5} + \frac{V_A}{10} = 0$$

$$\frac{2V_A - 40 + V_A}{10} = 0.$$

$$3V_A = 40 \Rightarrow V_A = \frac{40}{3} = 13.33\ V.$$

Writing eqn for V_{th}

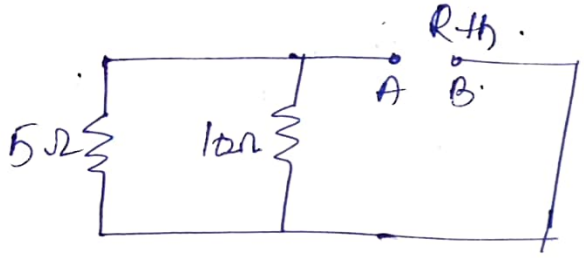
$$V_A - V_{th} + 10 = 0 \Rightarrow V_{th} = V_A + 10$$

$$= 13.33 + 10 = 23.33\ V$$

Step 2: Calculate R_{th}.

- Replace V.S ⟶ S.C

  C.S ⟶ O.C.



Parallel

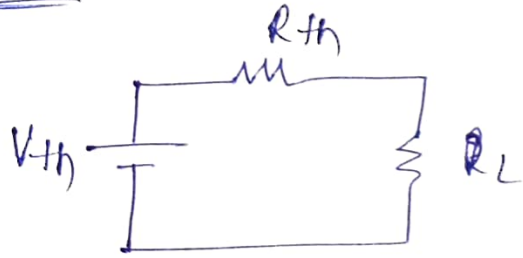
5||10

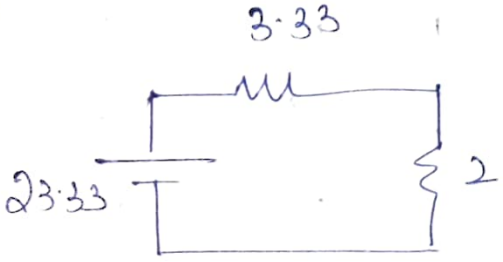
$$R_{th} = \frac{5 \times 10}{5+10} = \frac{50}{15} \Rightarrow 3.33\,\Omega.$$

$V_{th} = 23.33\,V.$

$R_{th} = 3.33\,\Omega$

Step 3: Calculate I_L





$$I_L = \frac{V_{th}}{R_{th}+R_L} = \frac{23.33}{3.33+2} = 4.37\,A.$$

Norton's Theorem

Steps to Calculate Norton's Theorem

Step 1: Calculate I_N By replacing load resistance with I_N Solving like mesh Analysis.

↓

No (Bada - chota) = V.

↓ jiske saath Bada

Jisko hum ghuma raha hai

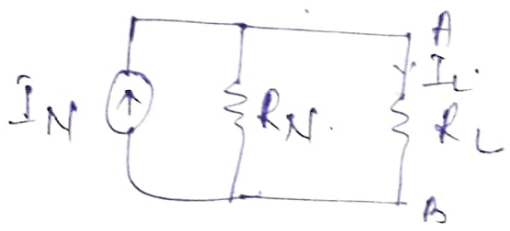
Step 2: Find R_N

By replacing voltage Source with short Circuit

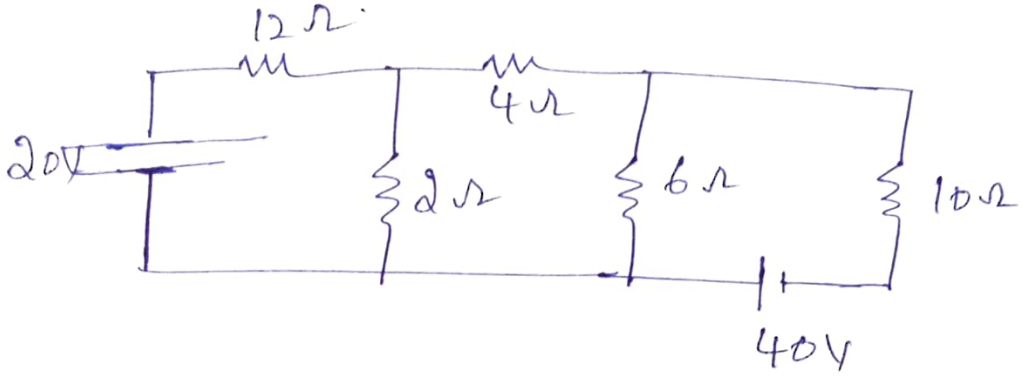
& Current " " open "

Solve like Series, parallel

Step 3: Calallate I_L.

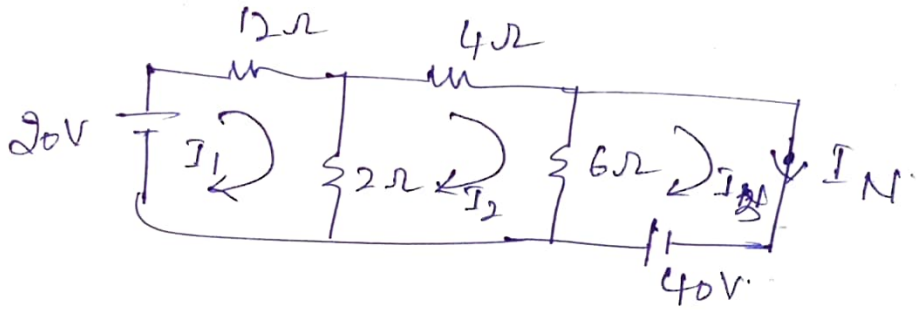


→ Find the Current through 10Ω Resistor using Norton's Theorem



→ For Step 1

Calculate I_N by replacing load resistance with I_N.



Solve like mesh Analysis

Trick (No C.S) useful when No (Bada - chota) = 0.

→ Apply kvl to mesh 1

$$2(I_1 - I_2) + 12I_1 = 20.$$

$$2I_1 - 2I_2 + 12I_1 = 20.$$

$$14I_1 - 2I_2 = 20. \quad \text{— (1)}$$

Apply kvl to Mesh (2)

$$2(I_2 - I_1) + 4I_2 + 6(I_2 - I_3) = 0.$$

$$2I_2 - 2I_1 + 4I_2 + 6I_2 - 6I_3 = 0 \Rightarrow -2I_1 + 12I_2 - 6I_3 = 0 \quad \text{— (2)}$$

Eqn (3)

$$6(I_3 - I_2) = 40.$$

$$6I_3 - 6I_2 = 40$$

↳ (3)

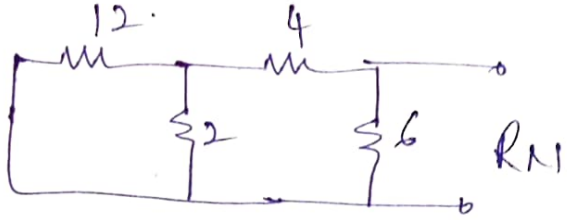
$I_1 = 2.5\ A$

$I_2 = 7.5\ A$

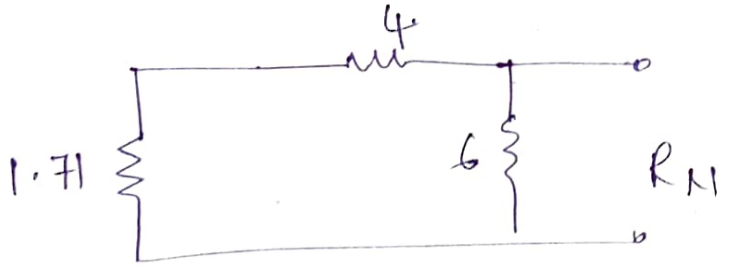
$I_3 = 14.16\ A$

$I_3 = I_N = 14.16A$

Step 2. Calculate R_N.



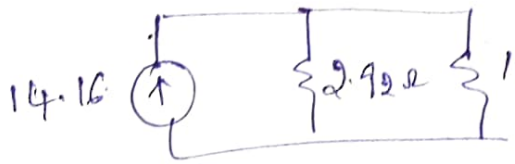
$$12 \parallel 2 = \frac{12 \times 2}{12+2} = 1.71$$



$$5.71 \parallel 6 = \frac{5.71 \times 6}{5.71+6} = 2.92\ \Omega$$

Step 3: Calculate I_L

$$I_L = \frac{I_N \times R_N}{R_N + R_L}$$



$$= \frac{14.16 \times 2.92}{2.92 + 10} = 3.19A$$