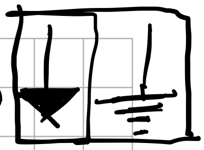
Node Analysis

Ground :⇒ 

(*) এখানে ultimately KCL ই করব।

solution steps:

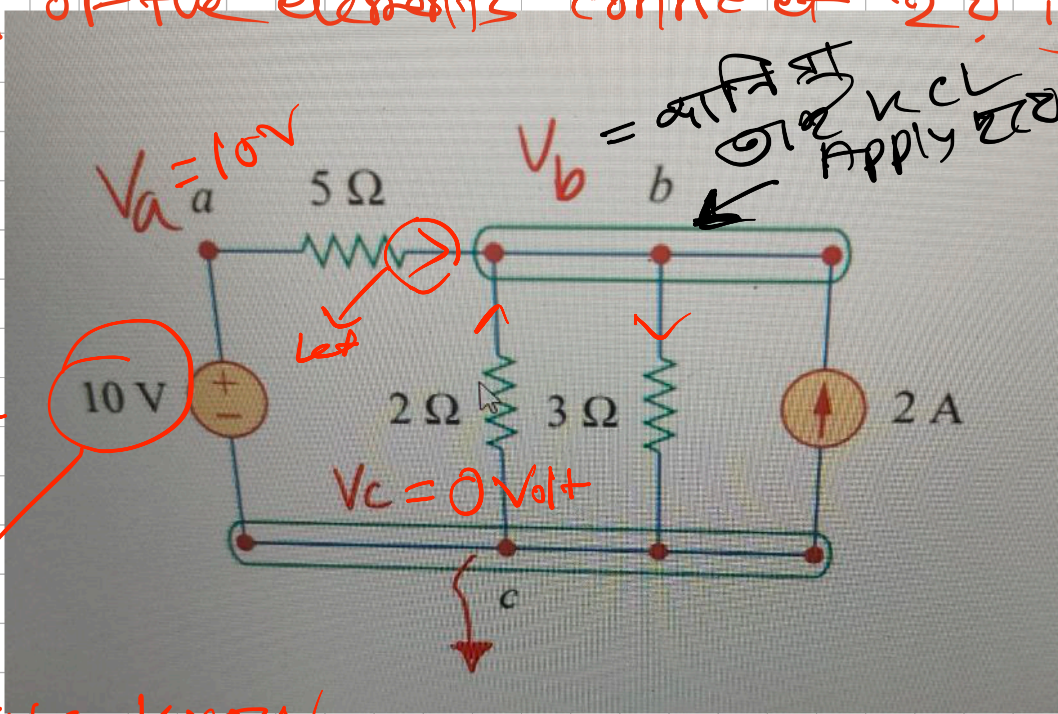
(*) 1. Node বের করব → 2. Node এর Voltage ধরে নেই → 3. Node গুলোয় KCL Apply করি → 4. Node Voltage গুলো পেয়ে যাই

→ এখানে Additionally Ground থাকে।

[যদি question এ না থাকে তাহলে নিজে Ground ধরে নিতে হবে।]

[সাধারণত Most of the voltage যেখানে most of the elements connect হয়।]

এখানে
a, node
b, node
c, node



→ we know
$V_{ab} = V_a - V_b \Rightarrow 10V = V_a - V_b \Rightarrow V_a - 0 = 10$

$\therefore V_a = 10V$

(***) Ground node যেখানে হবে তার voltage zero হবে।

KCL at V_b:

$I_{5\Omega} + I_{2\Omega} + 2A = I_{3\Omega}$

$\Rightarrow \frac{V_a - V_b}{5} + \frac{V_c - V_b}{2} + 2 = \frac{V_b - V_c}{3}$

We know,

$\therefore I_R = \frac{V_p - V_q}{R}$

এখানে V_a দেয়া V_b বের যায়।

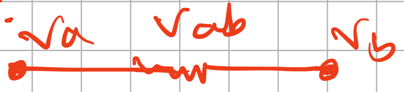
$\Rightarrow \frac{10 - V_b}{5} + \frac{0 - V_b}{2} + 2 = \frac{V_b - 0}{3}$

$\Rightarrow V_b = (\quad)$

$I = \frac{V_a - V_b}{R}$

Another Basic:

If:

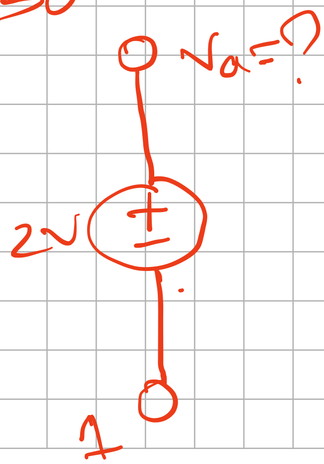


$V_{ab} = V_a - V_b$

$\Rightarrow V_a = V_{ab} + V_b$

$\Rightarrow V_b = V_{ab} + V_a$

So



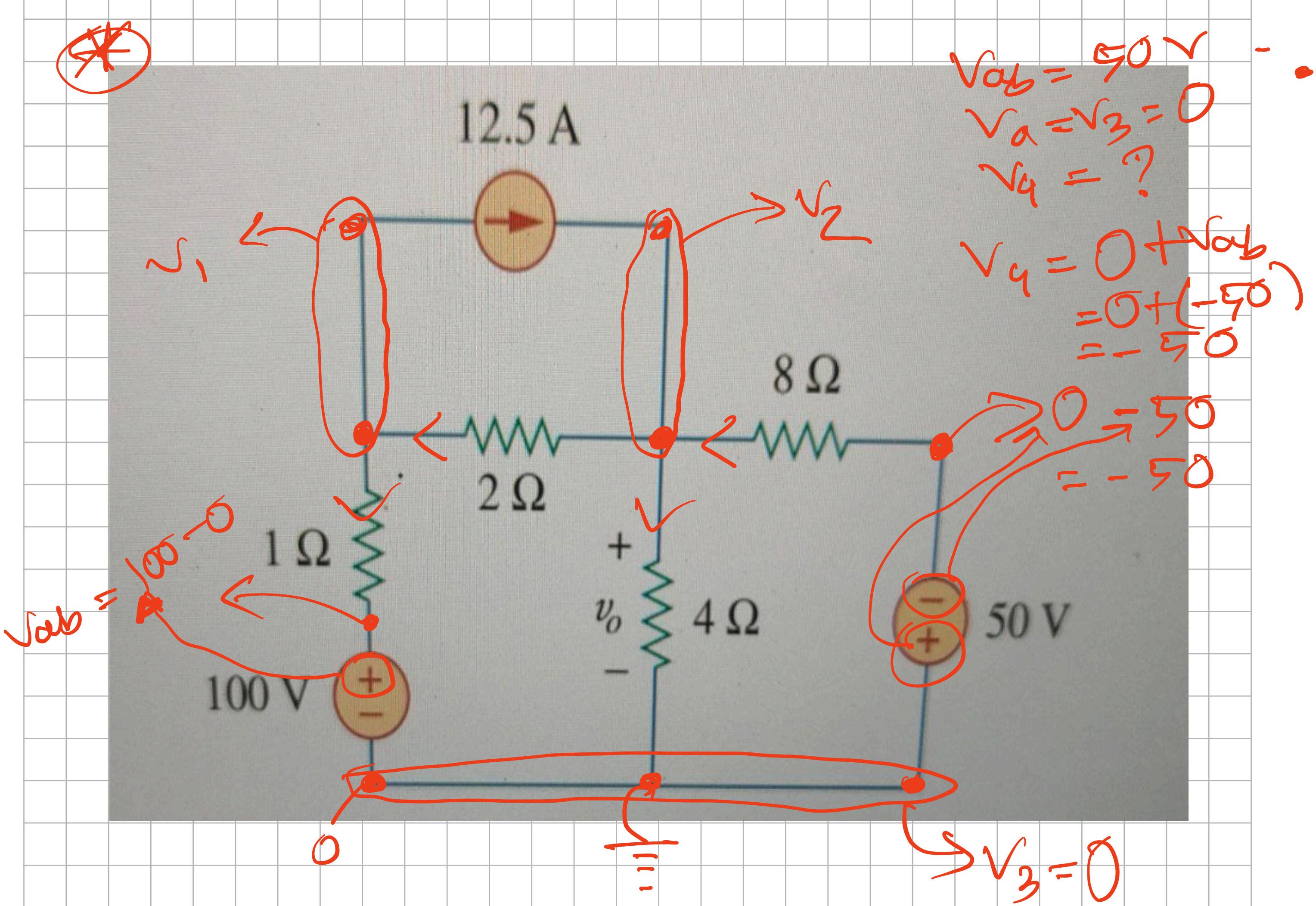
Here $V_{ab} = 2V$, $V_b = 1$

$V_a = V_{ab} + V_b$

$= 2 + 1$

$= 3V$

Ans



(★) Node নিব এবং Ground নিব

KCL at V_1:

$$\frac{V_2 - V_1}{2} = \frac{V_1 - 100}{1} + 12.5$$

$$\Rightarrow V_2 - V_1 = 2V_1 - 200 + 25$$

$$\Rightarrow 3V_1 - V_2 = 175 \quad \text{—— (1)}$$

KCL at V_2:

$$12.5 + \frac{-50 - V_2}{8} = \frac{V_2 - V_1}{2} + \frac{V_2 - 0}{4}$$

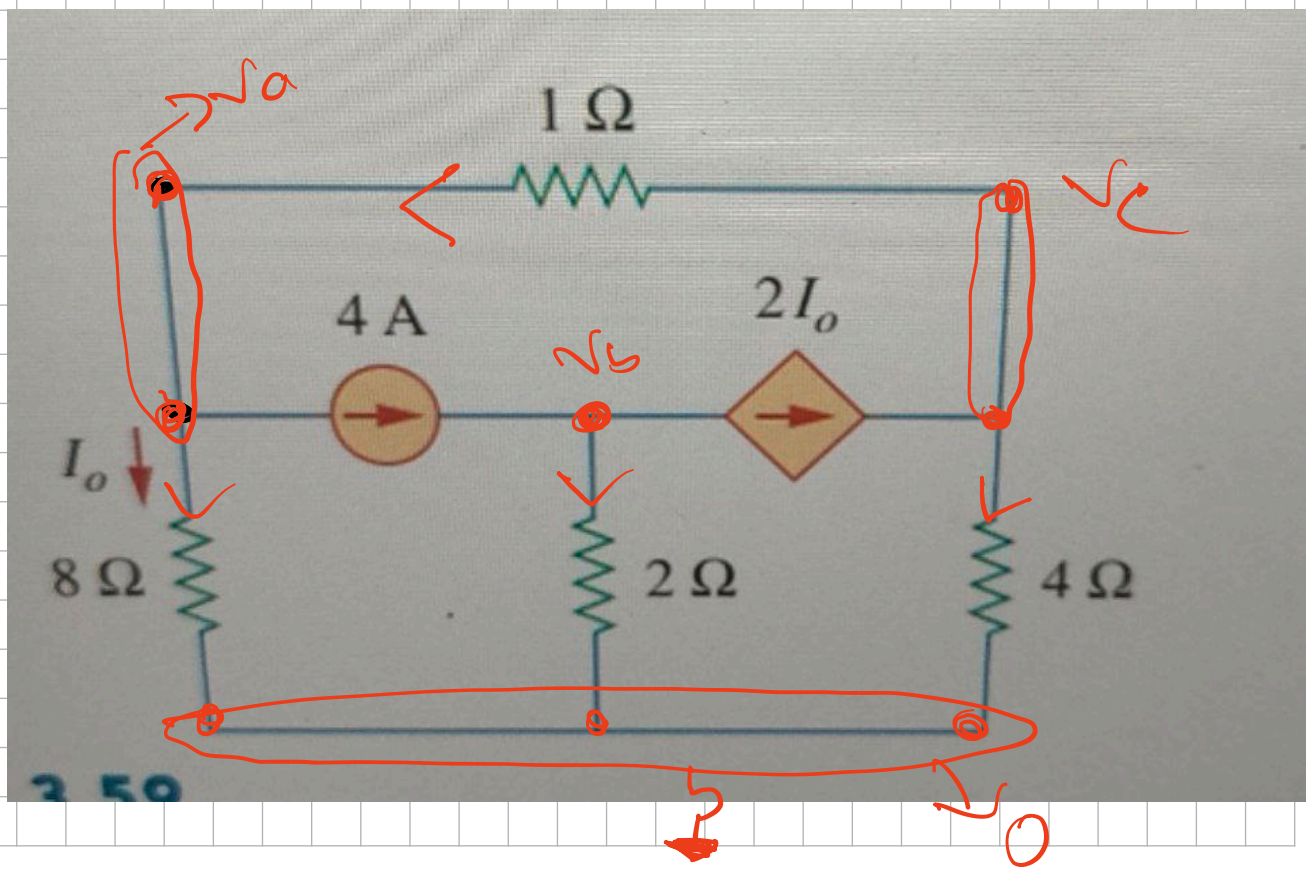
$$\Rightarrow 100 - 50 - V_2 = 4V_2 - 4V_1 + 2V_2$$

$$\Rightarrow -4V_1 + 7V_2 = 50 \quad \text{---------- (ii)}$$

Solving (i) and (ii) $\Rightarrow$

$V_1 = (\quad)$ and $V_0 = V_2 - 0$

$V_2 = (\quad)$



KCL at V_a:

$$\frac{V_c - V_a}{1} = \frac{V_a - 0}{8} + 4$$

$$\Rightarrow 8V_c - 8V_a = V_a + 32$$

$$\Rightarrow -9V_a + 8V_c = 32 \quad \text{——— (I)}$$

KCL at V_b:

$$\frac{V_b - 0}{2} + 2I_o = 4$$

$$\Rightarrow V_b + 4I_o = 8$$

$$\Rightarrow V_b + 4 \times \frac{V_a - 0}{8} = 8$$

$$\Rightarrow V_a + 2V_b = 16 \quad \text{——— (II)}$$

KCL at V_c:

$$2I_o' = \frac{V_c - V_a}{1} + \frac{V_c - 0}{4}$$

$$\Rightarrow 2 \times \frac{V_a - 0}{8} = V_c - V_a + \frac{V_c}{4}$$

$\Rightarrow 2V_a = 8V_c - 8V_a + 2V_c$

$\Rightarrow 10V_a - 10V_c = 0$ ———— (iii)

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

$V_a =$

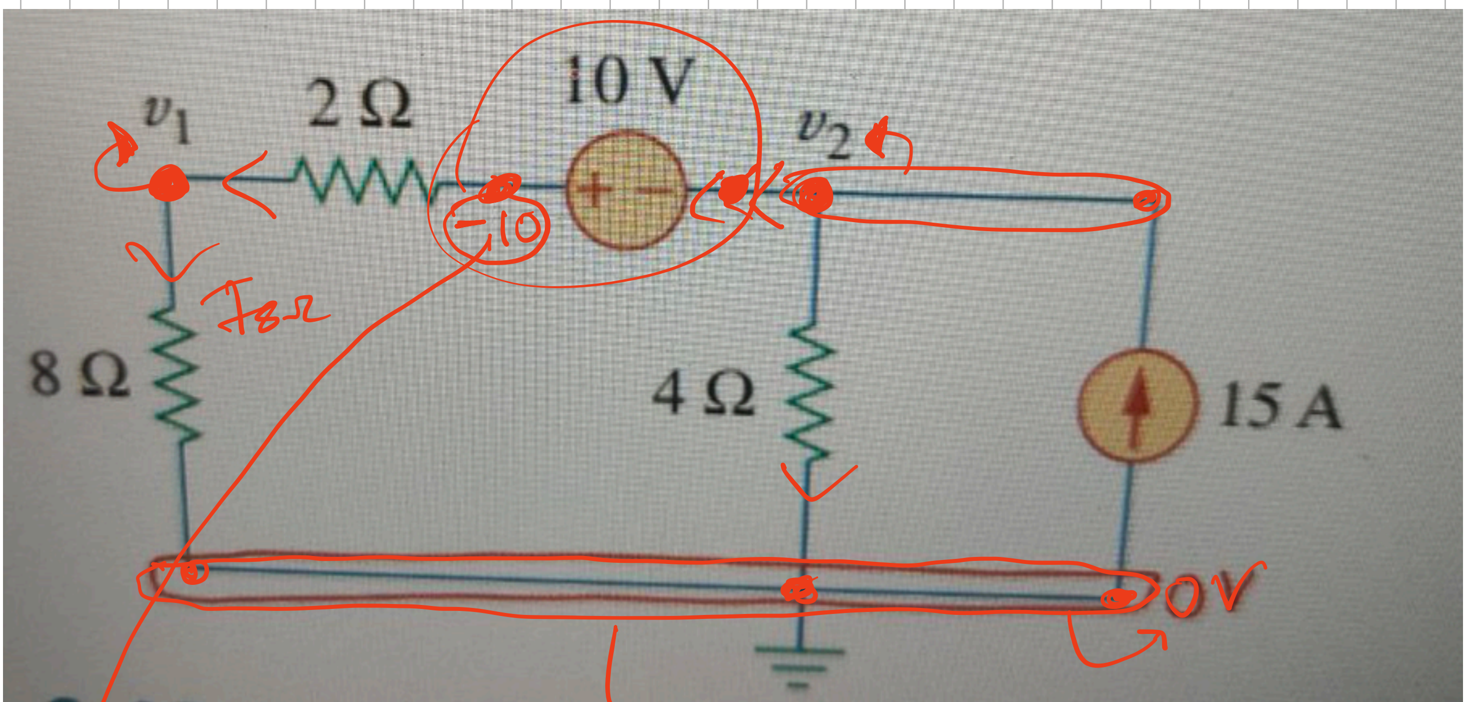
$V_b =$

$V_c =$

$\therefore I_{8} = \dfrac{V_a}{8}$

Ans

(*)



$\Rightarrow$ [illegible] Issue হলো

KCL at V_2:

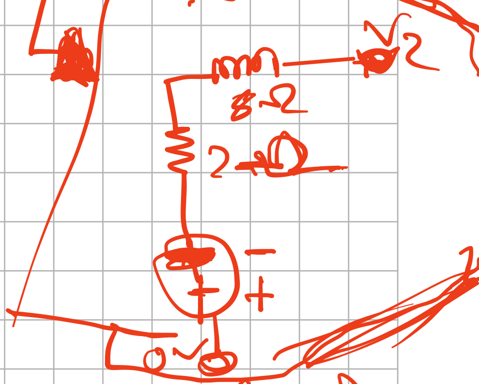
$$15 = \frac{V_2}{4} + \frac{V_2-(-10)}{10}$$

Ground voltage source এর opposite এ। তখন মনে হবে voltage কে Ground এর সমান বিবেচনা করতে হবে। এখানে ধরব

$$\Rightarrow 150 = 2.5V_2 + V_2 + 10$$

$$\Rightarrow 3.5V_2 = 140$$

$$\therefore V_2 = 40$$



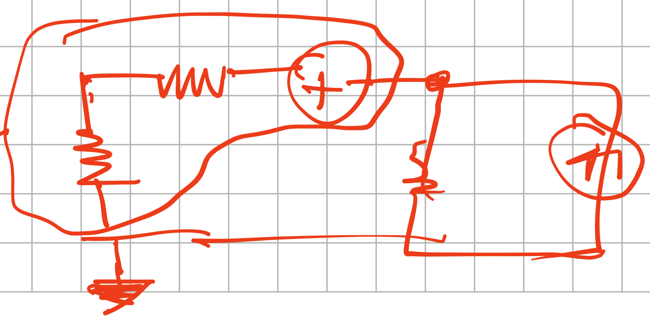
KCL at V_1: $V_{8\Omega} = V_1 - 0$, $V_{8\Omega} = V_1$

$$I_{8\Omega} = I_{2\Omega} = \frac{V_2-(-10)}{10} = \frac{50}{10} = 5A$$

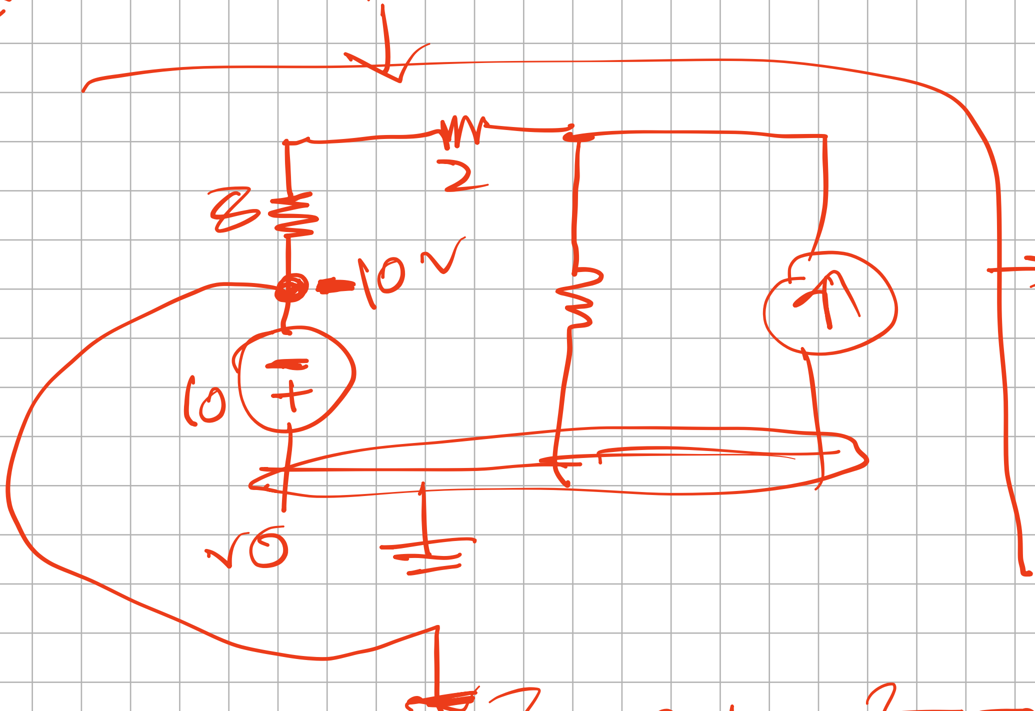
$$V_1 = I_{8\Omega} \times 8 = 5 \times 8 = 40V$$

[Issue: Voltage এর source এর প্রান্ত এর voltage আনা যাবে।]

[এই type Math solution করার জন্য voltage source টাকে Ground এর সাথে কল্পনা করে soln করতে হবে। তবে খেয়াল। এখানে এরা সবাই series এ আছে।



এই একই Rearranging এর Voltage source থেকে Ground এর বাদে নিব। এখানে



এইটা বাড়তি/বাদ দিব।

এ হয় একটাই এই Node হবে count করতে পারি $V_1 = -10 - 0 = -10V$

এবার node voltage value পেলাম আমি এই math করতে পারব।