Here,

$$R_{a-c} = \cancel{(9+R_1)}\ (9 \| R_1) + (9 + R_3)$$

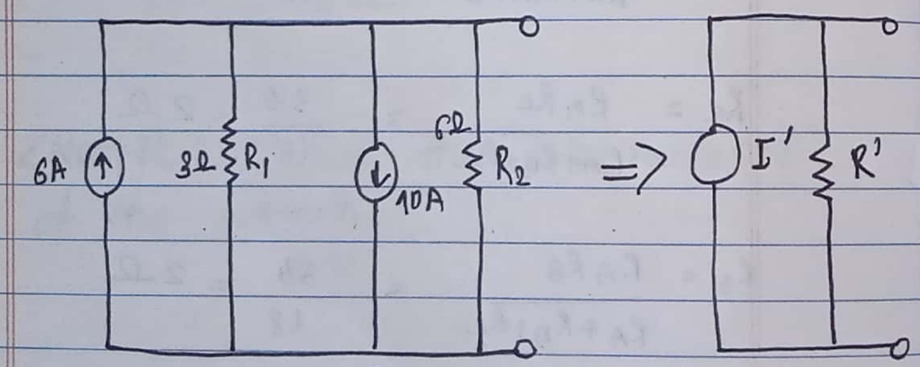
[$\because R_2$ is external path]

$$= \frac{9\times2}{9+2} + \frac{9\times2}{9+2}$$

$$= \frac{36}{11}$$

$$\therefore R_{a-c} = R_T = 3.27\ \Omega$$

<Num.No.33>: Convert the parallel current source to a single current source.

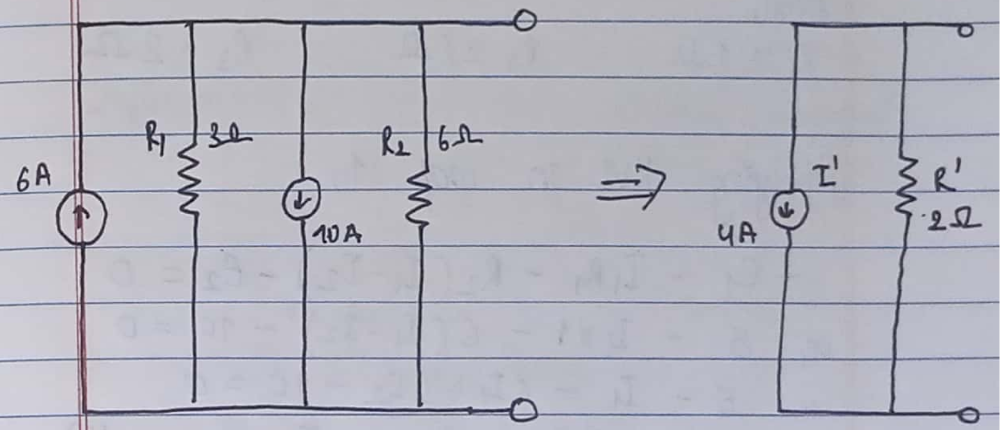


Sol^n:

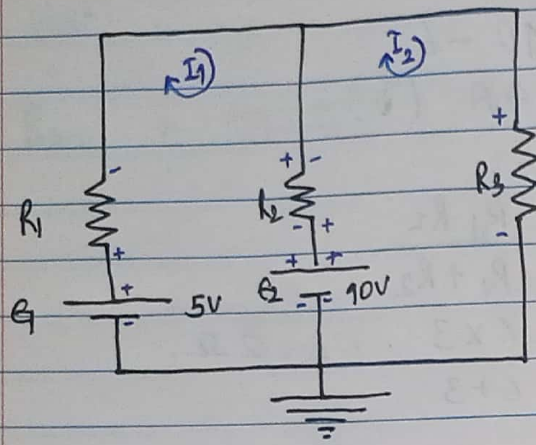
$$\therefore I' = 10 - 6$$
$$= 4\text{A}\ (\downarrow)$$

$$\therefore R' = \frac{R_1 R_2}{R_1 + R_2} = \frac{6\times3}{6+3} = 2\ \Omega.$$

Then,



<Num.No.34>: Find the current through each branch of the network in figure.



Given,

$R_1 = 1\,\Omega$ $R_2 = 6\,\Omega$ $R_3 = 2\,\Omega$

Applying KVL in loop 1,

$+E_1 - I_1R_1 - R_2(I_1 - I_2) - E_2 = 0$

or, $5 - I_1 \times 1 - 6(I_1 - I_2) - 10 = 0$

or, $5 - I_1 - 6I_1 + 6I_2 - 10 = 0$

or, $-7I_1 + 6I_2 = 5$ ——— (i)

Applying KVL in loop 2,

$+E_2 - R_2(I_2 - I_1) - R_3 I_2 = 0$

or, $10 - 6(I_2 - I_1) - 2I_2 = 0$

or, $3I_1 - 4I_2 = -5$ —— (ii)

Solving (i) and (ii), we get.

$I_1 = 1\,A$

$I_2 = 2\,A$.

Now,

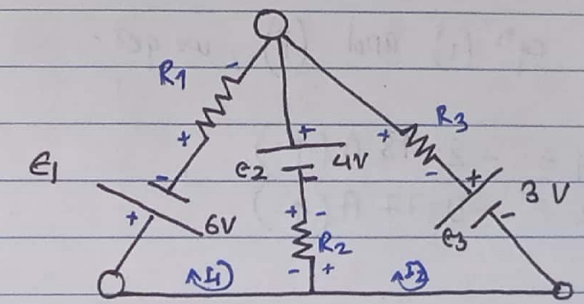
$I_{R1} = 1\,A\ (\uparrow)$

$I_{R3} = 2\,A\ (\downarrow)$

$I_{R2} = I_2 - I_1 = 1\,A\ (\uparrow)$ {for I_2}.

<Num.No.35>: Find the branch current.

Soln:



Given,

$R_1 = 2\,\Omega$ $R_2 = 4\,\Omega$ $R_3 = 6\,\Omega$.

Applying KVL in loop 1,

$$-E_1 - I_1R_1 - E_2 - R_2(I_1 - I_2) = 0$$

or, $-6 - 2I_1 - 4 - 4(I_1 - I_2) = 0$

or, $-6 - 2I_1 - 4 - 4I_1 + 4I_2 = 0$

or, $-6I_1 + 4I_2 = 10$ —— (i)

Applying KVL in loop 2,

$$-E_3 - R_2(I_2 - I_1) + E_2 - R_3 I_2 = 0$$

or, $-3 - 4I_2 + 4I_1 + 4 - 6I_2 = 0$

or, $4I_1 - 10I_2 = -1$ —— (ii)

Solving eq^n (i) and (ii), we get.

$\therefore I_1 = -2.18\ A\ (\uparrow)$

$\therefore I_2 = -0.77\ A\ (\uparrow)$

Now,

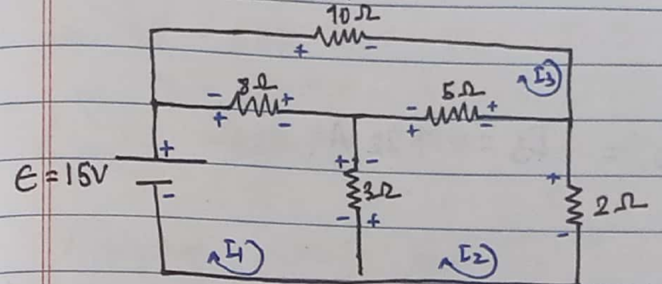
$I_{R1} = -2.18\ A\ (\uparrow)$

$I_{R3} = -0.77\ A$ $(\downarrow)$

$I_{R2} = I_1 - I_2 = -1.41\ A$ {for I_1}

<Num. No. 36>: Find the current through the 10Ω resistor of the network.

Sol^n:



Applying KVL at loop 1,

$$+E_1 - 8(I_1 - I_3) - 3(I_1 - I_2) = 0$$

or, $15 - 8I_1 + 8I_3 - 3I_1 + 3I_2 = 0$

or, $-11I_1 + 3I_2 + 8I_3 = -15$ —(i)

Applying KVL at loop 2,

$$-2I_2 - 3(I_2 - I_1) - 5(I_2 - I_3) = 0$$

or, $-2I_2 - 3I_2 + 3I_1 - 5I_2 + 5I_3 = 0$

or, $3I_1 - 10I_2 + 5I_3 = 0$ —(ii)

Applying KVL at loop 3,

$$-5(I_3 - I_2) - 8(I_3 - I_1) - 10I_3 = 0$$

or, $-5I_3 + 5I_2 - 8I_3 + 8I_1 - 10I_3 = 0$

or, $8I_1 + 5I_2 - 23I_3 = 0$ —(iii)

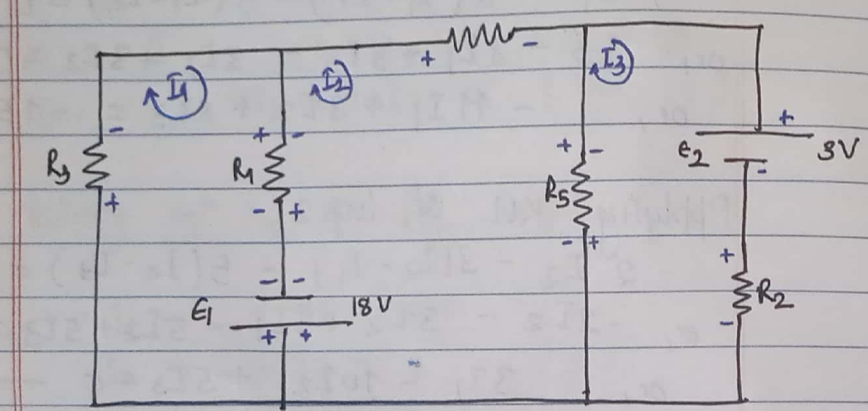
Solving (i), (ii), (iii),

$I_1 = 2.63\ A$
$I_2 = 1.39\ A$
$I_3 = 1.22\ A.$

Now,
$\therefore I_{R10} = I_3 = 1.22\ A.$

<Num. No 37>: Find all the branch current.

Sol^n:



Given,

$R_1 = 7.5\ k\Omega$ $\quad R_4 = 7.5\ k\Omega$
$R_2 = 3.3\ k\Omega$ $\quad R_5 = 2.2\ k\Omega$
$R_3 = 6.8\ k\Omega$

Applying KVL in loop 1,

$+E_1 - R_3 I_1 - R_1(I_1 - I_2) = 0$
or, $18 - 6800 I_1 - 7500(I_1 - I_2) = 0$
or, $18 - 6800 I_1 - 7500 I_1 + 7500 I_2 = 0$
or, $\cancel{6800 I_1} - 14300 I_1 + 7500 I_2 = -18$ —(i)

Applying KVL in loop 2,

$-E_1 - R_1(I_2 - I_1) - R_4 I_2 - R_5(I_2 - I_3) = 0$
or, $-18 - 7500(I_2 - I_1) - 7500 I_2 - 2200(I_2 - I_3) = 0$
or, $-18 - 7500 I_2 + 7500 I_1 - 7500 I_2 - 2200 I_2 + 2200 I_3 = 0$
or, $7500 I_1 - 17200 I_2 + 2200 I_3 = 18$ —(ii)

Applying KVL in loop 3,

$-E_2 - 3300 I_3 - 2200(I_3 - I_2) = 0$
or, $-3 - 3300 I_3 - 2200 I_3 + 2200 I_2 = 0$
or, $2200 I_2 - 5500 I_3 = 3$ —(iii)

Solving (i), (ii) and (iii),
$I_1 = 9.85 \times 10^{-4} = 0.985\ mA$
$I_2 = -5.20 \times 10^{-4} = -0.520\ mA$
$I_3 = 7.535 \times 10^{-4} = 0.753\ mA.$

Now,

$I_{R3} = I_1 = 0.985\ mA\ (\uparrow)$

$I_{R1} = I_1 - I_2 = 0.980 + 0.520 = 1.5\ mA\ (\downarrow)$

$I_{R4} = I_2 = -0.520\ mA\ (\rightarrow)$

$I_{R5} = I_2 - I_3 = -0.520 + \cancel{0}.753 = 0.233\ (\downarrow)$

$I_{R2} = I_3 = 0.753\ mA\ (\downarrow)$