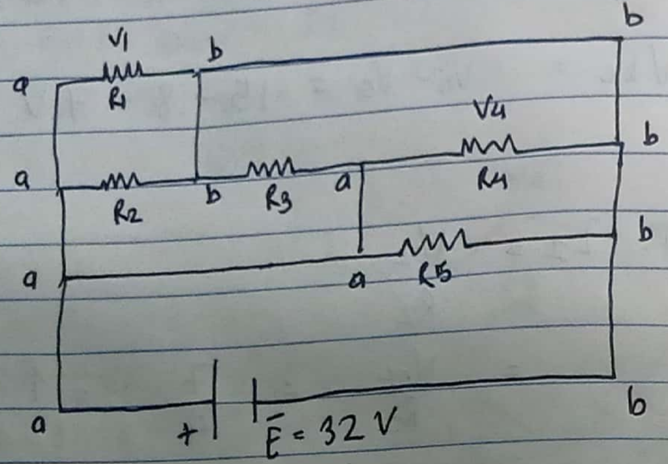
<Num. No 29>: Determine R_1, V_1 & V_4.

Sol^n:

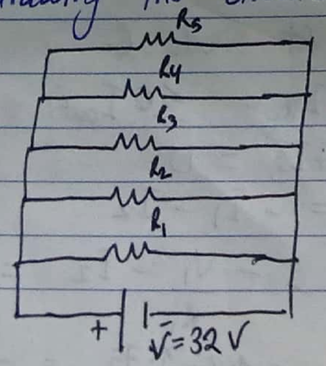


Here, $R_1 = 16\,\Omega$ $\quad R_2 = 8\,\Omega$

$R_3 = 4\,\Omega$ $\quad R_4 = 32\,\Omega$ $\quad R_5 = 16\,\Omega$

and from figure, we can see, all the resistors are in parallel as they have common terminal.

So, redrawing the circuit,



So,

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5}$$

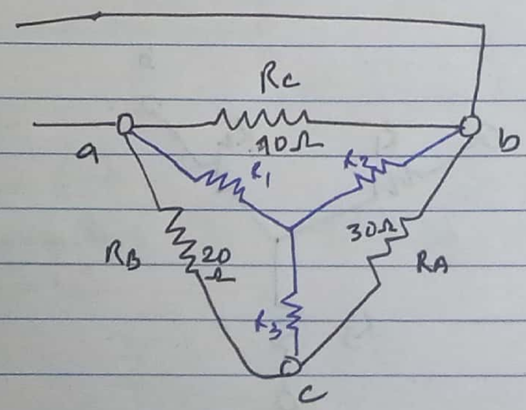
or $$\frac{1}{R_T} = \frac{1}{16} + \frac{1}{8} + \frac{1}{4} + \frac{1}{32} + \frac{1}{16}$$

or $$\frac{1}{R_T} = \frac{17}{32}$$ $\quad \therefore R_T = 1.88\,\Omega$.

Thus, since the resistors are in parallel,

$V_1 = V_4 = E = 32\,V$

<Num. No. 30>: Convert the Δ into the Y.



Given,

$R_A = 30\,\Omega$

$R_B = 20\,\Omega$

$R_C = 10\,\Omega$.

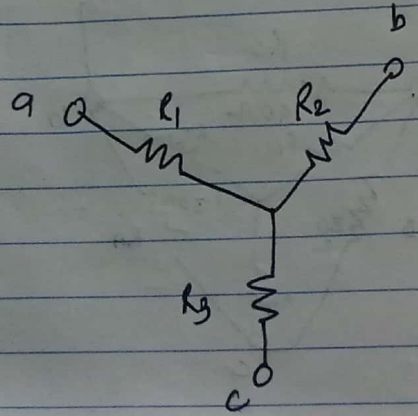
Now,

$$R_1 = \frac{R_B R_C}{R_A + R_B + R_C} = \frac{20 \times 10}{30+20+10} = 3.33\,\Omega$$

$$R_2 = \frac{R_A R_C}{R_A + R_B + R_C} = \frac{30 \times 10}{30+20+10} = 5\,\Omega$$

$$R_3 = \frac{R_A R_B}{R_A + R_B + R_C} = \frac{30 \times 20}{30+20+10} = 10\,\Omega.$$

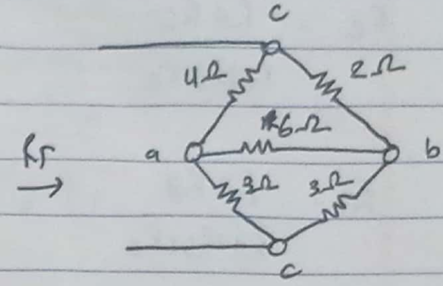
So,

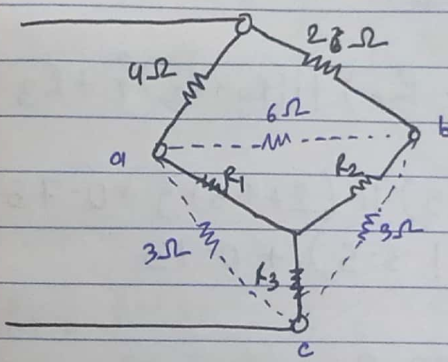


<Num.No.31>: For the network, find the total resistance.

Soln,

Here, redrawing the given circuit,





Here,

$R_C = 6\,\Omega$

$R_B = 3\,\Omega$

$R_A = 3\,\Omega$

and

$R_x = 4\,\Omega$

$R_y = 2\,\Omega$

So,

$$R_1 = \frac{R_B R_C}{R_A + R_B + R_C} = \frac{3 \times 6}{3+6+3} = 1.5\,\Omega$$

$$R_2 = \frac{R_A R_C}{R_A + R_B + R_C} = \frac{3 \times 6}{3+6+3} = 1.5\,\Omega$$

$$R_3 = \frac{R_A R_B}{R_A + R_B + R_C} = \frac{3 \times 3}{3+6+3} = 0.75\,\Omega.$$

Now, we know,

$$R_T = \{(R_x + R_1) \,||\, (R_y + R_2)\} + R_3$$

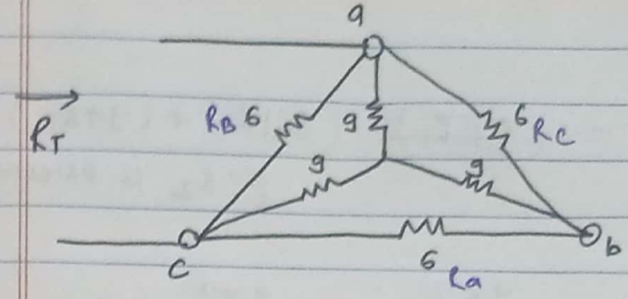
$$= \{(4 + 1.5) \,||\, (2 + 1.5)\} + 0.75$$

$$= (5.5 \,||\, 3.5) + 0.75$$

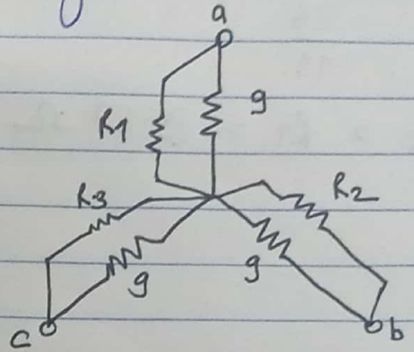
$$\therefore R_T = 2.89\,\Omega$$

<Num.No.32>: Find the total resistance of the network.

Soln



Redrawing the circuit,



$$R_1 = \frac{R_B R_C}{R_A + R_B + R_C} = \frac{36}{18} = 2\,\Omega$$

$$R_2 = \frac{R_A R_C}{R_A + R_B + R_C} = \frac{36}{18} = 2\,\Omega$$

$$R_3 = \frac{R_A R_B}{R_A + R_B + R_C} = \frac{36}{18} = 2\,\Omega$$

Here,

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

[$\because R_2$ is external path]

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

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

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