Report:

Circuit 1:

Given,

$V = 12V$

$R_1 = 10k\Omega$

$R_2 = 10k\Omega$

$R_3 = 1k\Omega$

$R_4 = 1k\Omega$

Now,

$$I_1 = \frac{V_1}{R_1} = \frac{8.57}{10000} = 0.857\ mA$$

$$I_2 = \frac{V_2}{R_2} = \frac{8.57}{10000} = 0.857\ mA$$

Here,

V_1 (volts)	V_2 (volts)	$V = V_1 + V_2$ (volts)	I_1 (mAmp)	I_2 (mAmp)	$I = I_1 + I_2$ (mAmp)
8.57V	3.43V	12V	0.857 nA	0.857 mA	1.714 mA

Circuit - 2:

Given,

$V = 12V$

$R = 10k\Omega$

$R_2 = 10k\Omega$

$R_3 = 10k\Omega$

$R_4 = 1k\Omega$

$R_5 = 10k\Omega$

$R_6 = 1k\Omega$

Now,

$I_1 = \frac{V_1}{R_1} = \frac{11}{10} = 1.1mA$

$I_2 = V_2/R_2 = 1.01/1 = 1.01mA$

$I_3 = V_3/R_3 = 0.092mA$

$I_4 = V_4/R_4 = 0.08mA$

$I_5 = 0.07/10 = 0.007mA = V_5/R_5$

$I_6 = V_6/R_6 = 0.007mA$

V_1	V_2	V_3	V_4	V_5	V_6	I_1	I_2	I_3	I_4	I_5	I_6
11V	1.09V	0.92V	0.08V	0.07V	0.007V	1.1mA	1.01mA	0.08mA	0.08 mA	0.007 mA	0.007mA

Here,

$V_{total} = 13.082V$

$V_{given} = 12V$

∴ The calculated value of the circuit from multimeter is not same as the given one. Therefore, discrepancies exists in this circuit.

Questions:

Ans no. 1

For circuit -1:

Given,

$V = 12\,V$

$R_1 = 10\,k\Omega$

$R_2 = 10\,k\Omega$

$R_3 = 1\,k\Omega$

$R_4 = 1\,k\Omega$

Now,

For, R_1 & R_2

$$R_p = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1}$$

$$= \left(\frac{1}{5}\right)^{-1} = 5\,k\Omega$$

$$\therefore R_{eq} = R_p + R_3 + R_4$$

$$= 7\,k\Omega$$

Now, We know,

$$I = V/R$$

$$= 12/7 = 1.714\,mA$$

For circuit -2:,

Given,

$R_1 = 10k\Omega$

$R_2 = 10k\Omega$

$R_3 = 10k\Omega$

$R_4 = 1k\Omega$

$R_5 = 10k\Omega$

$R_6 = 1k\Omega$

$V = 12V$

Here,

$R_{P_1} = R_5 + R_6$

$= (10+1)k\Omega$

$= 11k\Omega$

$R_{P_3} = (R_3 + R_{P_1})$

$= (10 + \frac{11}{1}) k\Omega$

$= \frac{131}{12} k\Omega$

$R_{P_2} = \left(\frac{1}{R_{P_1}} + \frac{1}{R_4}\right)^{-1}$

$= \left(\frac{12}{11}\right)^{-1} = \frac{11}{12} k\Omega$

$R_{P_4} = \left(\frac{1}{R_{P_3}} + \frac{1}{R_2}\right)^{-1}$

$= \left(\frac{12}{131} + 1\right)^{-1}$

$= \left(\frac{143}{131}\right)^{-1} = \frac{131}{143} k\Omega$

$R_{equ} = (R_1 + R_{P_4})$

$= \left(10 + \frac{131}{143}\right) = \frac{1561}{143} k\Omega = 10.91 k\Omega$

$$I = \frac{V}{R_{eqv}} = \frac{12}{10.91} = 1.099\,mA$$

∴ The calculated value of the circuit is of current in same as the multimeter's output of the circuit.

Ans no. 2

Let, the six resistors be, R_1, R_2, R_3, R_4 R_5 and R_6. If R_1 and R_2, and R_3, R_4 are connected with parallel, and then they are connected by series with R_5 and R_6, we will get equivalent resistance 300 ohm.

Here,

$$R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1} + \left(\frac{1}{R_3} + \frac{1}{R_4}\right)^{-1} + R_5 + R_6$$

$$= \left(\frac{1}{100} + \frac{1}{100}\right)^{-1} + \left(\frac{1}{100} + \frac{1}{100}\right)^{-1} + 100 + 100$$

$$= 50 + 50 + 100 + 100$$

$$= 300 \text{ ohm } \Omega \quad \text{(Ans.)}$$

Ans no. 3

Given,

$R_1 = R_2 = 1.5\,k\Omega$

$R_3 = R_4 = R_5 = R_6 = R_7 = R_8 = 15\,k\Omega$

Here, if R_1, R_2 are connected in parallel and then in series with, $R_3, R_4, R_5, R_6, R_7, R_8$ connected in parallel.

Now,

$$R_{eq} = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1} + \left(\frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5} + \frac{1}{R_6} + \frac{1}{R_7} + \frac{1}{R_8}\right)^{-1}$$

$$= \left(\frac{1}{1.5} + \frac{1}{1.5}\right)^{-1} + \left(\frac{1}{15} + \frac{1}{15} + \frac{1}{15} + \frac{1}{15} + \frac{1}{15} + \frac{1}{15}\right)^{-1}$$

$$= \frac{3}{4} + \frac{5}{2} = \frac{13}{4} = 3.25\,\Omega$$

(Ans.)

Discussion:

After the completion of this experiment, we get to learn the physical application of ohm's law and the devices to create the circuit. It shows us about determing and measuring the value of current, resistance and voltage.