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Section: A

Q1a) There are two well-known formula for calculation the total resistance. Write these two formulas.

Ans. For two resistance

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_T} = \frac{R_2 + R_1}{R_1 \cdot R_2}$$

$$\frac{1}{R_T} = \frac{R_1 + R_2}{R_1 \cdot R_2}$$

$$R_T = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

Q For more than two resistance (2)

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_n}$$

Q 1b) A quantity often useful in electric circuit analysis is conductance  $G = \frac{1}{R}$ . In a series  $\text{---}$  parallel resistor.

In a parallel circuit resistance decrease and conductance increases with the addition of more resistors.

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\text{So } G_1 = \frac{1}{R_1}, \quad G_2 = \frac{1}{R_2}$$

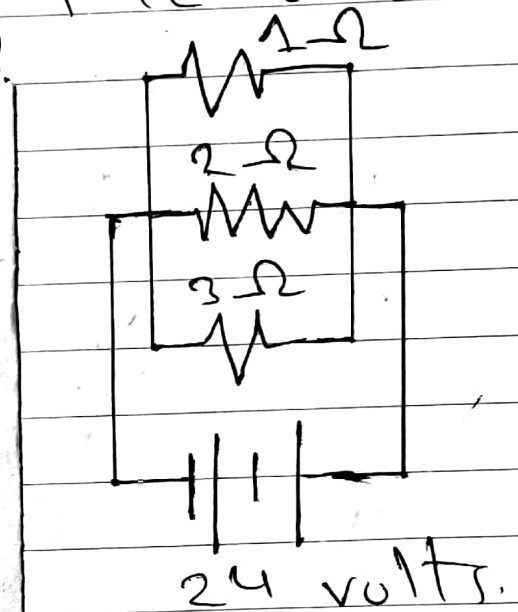
$$G_T = G_1 + G_2$$

$\Rightarrow$

Q2) In the given circuit, three resistors receive the same amount of voltage (24 volts) from single source calculate the amount resistors?

Given:  $R_1 = 1\ \Omega$   
 $R_2 = 2\ \Omega$   
 $R_3 = 3\ \Omega$   
 $V = 24V$

Required:  
 $I_1, I_2, I_3 = ?$   
 $P_1, P_2, P_3 = ?$



Soln.

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{1} + \frac{1}{2} + \frac{1}{3}$$

$$= \frac{3+6+2}{6}$$

$$= \frac{11}{6}$$

$$R_{eq} = \frac{6}{11} = 0.54 \Omega$$

=> For  $I_1$

$$V = I_1 R$$

$$\frac{V}{R} = \frac{I_1 R}{R}$$

$$I_1 = \frac{V}{R_1} = \frac{24}{1} = \boxed{24 \text{ A}}$$

=> For  $I_2$

$$I_2 = \frac{V}{R_2} = \frac{24}{2} = \boxed{12 \text{ A}}$$

=> For  $I_3$

$$I_3 = \frac{V}{R_3} = \frac{24}{3} = \boxed{8 \text{ A}}$$

\* Power

for  $P_1$ ,  $I_1 = 24A$ ,  $V = 24V$

$$P_1 = I_1 \times V$$

$$= 24 \times 24$$

$$= \boxed{576 \text{ watts}}$$

For  $P_2$ :  $I_2 = 12A$ ,  $V = 24V$

$$P_2 = I_2 V$$

$$P_2 = 12 \times 24$$

$$P_2 = \boxed{288 \text{ watts}}$$

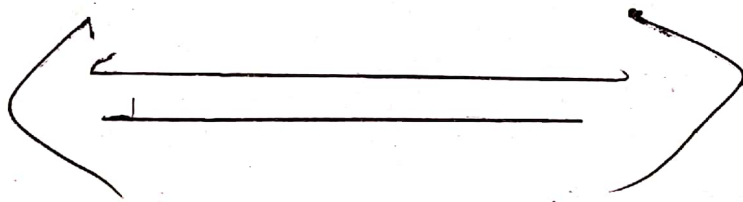
For  $P_3$ ,  $I_3 = 8A$ ,  $V = 24 \text{ volts}$

$$P_3 = I_3 V$$

$$= 8 \times 24$$

$$P_3 = \boxed{192 \text{ watts}}$$

Resistor	voltage	Current	Power
1 $\Omega$	24 v	24 Amp	576 watts.
2	24 v	12 Amp	288 watts
3	24 v	8 Amp	192 watts



Q3) Differentiate between the following :

(a) Current :

- Current is the rate at which electric charge flows past a point in a circuit.
- Measured by Ammeter.
- A magnetic field.
- Unit "A" or "amps".
- Current is same through all components connected in series.
- Current gets distributed over components connected in parallel.

~~Q4~~ Voltage :

- It is also called electromotive force, is the potential difference in charge btw ~~points~~ two points in an electrical field.
- An electrostatic field.
- Voltage gets distributed over components connected in series.

- Voltages are same across all components connected in parallel.
- Measured by Voltmeter.
- Unit V or Volts or voltage.

## (b) Resistance

- Resistance is "blockade".
- Can be imagined as inversely related.
- Depends on resistivity of the material.

## Conductance

Conductance allows to flow or pass.

Conductance depends on conductivity property of material.



## (C) Power

- Power is how fast you can do it.
- Power is energy per unit of time.
- Power is watts.

## Energy

- Total amount of work done.
- It can also be transformed from one form to another.
- Energy is watt-hours.

## (D) Inductance

- Inductance is a property of current carrying conductor which generates a magnetic field around the conductor.
- Inductors "resist" changes in current.

## Capacitance

- It is the ratio of the change in electric charge of a system to the corresponding change in its electric potential.

$$C = \frac{Q}{V}$$

## (F) Synchronous motor

- It is a machine whose rotor speed and the speed of the stator magnetic field is equal.
- Very costly.
- Efficiency is greater.

## Asynchronous Motor

- It is a machine whose rotor rotates at the speed less than synchronous speed.

- Less costly

- Less efficient.

