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Subject :- Basic Electro-Mechanical

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Q1 (a) There are two well-known formula for calculating the total resistance ------- Write these two formula?

Ans For two resistance

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

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

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

For more than two resistance.

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

1(b) A quantity often useful in electric circuit analysis is conductance ------ $G_1 = 1/R$

In a series ---------- parallel resistor.

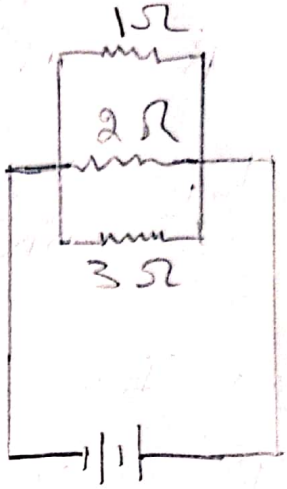
Ans In a parallel circuit resistance decrease and conductance increase with the addition of more resistors. because

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

So $G_1 = 1/R_1$, $G_{12} = 1/R_2$

$$G_{1T} = G_1 + G_{12}$$

Q2 In the given circuit, three resistors recieve the same amount of voltage (24 Volts) From single source. Calculate the amount ---- ---------- resistor.



Ans Given:-

$R_1 = 1\,\Omega$

$R_2 = 2\,\Omega$

$R_3 = 3\,\Omega$

Volts = 24 v

*Required

$I_1, I_2, I_3 = ?$

$P_1, P_2, P_3 = ?$

Solution:-

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

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

$$\frac{1}{R_{eq}} = \frac{6+3+2}{6}$$

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

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

⇒ for I_1

$$V = I_1 R$$

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

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

⇒ for I_2

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

⇒ for I_3

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

★ Power

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

$$P_1 = I_1 \times V$$
$$= 24 \times 24$$
$$= 576 \text{ watts}$$

for P_2: $I_2 = 1.2\ A$, $V = 24\ V$

$$P_2 = I_2 V$$

$P_2 = 12 \times 24$

$P_2 = 288$ watts

For P_3, $I_3 = 8A$, $V = 24$ Volts

$P_3 = I_3 V$

$= 8 \times 24$

$P_3 = 192$ watts.

Resistor	Voltage	current	Power
1Ω	24V	24 Amp	576 watts
2	24V	12 Amp	288 watts
3	24V	8 Amp	192 watts

Q3 Differentiate b/w the Following

(a) Current and Voltage:-

	Current	Voltage
* Def:-	Current is the rate at which electric charge flows past a point in a circuit.	voltage is the P.D in charge b/w two points in an electrical field.
* Symbol:-	I	V
* Unit:-	Amphere (A)	volts (V)
* SI Unit:-	1 amp = 1 colomb / second	1 volt = 1 J / colllomb (V = W/C)
* Field created:-	A magnetic field	An electrostatic field.
* In series connection:-	current is the same through all components connected in series	voltage get distributed over component connect in series.
* In parallel:-	gets distributed over components connect in parallel	It is the same across all component connected in parallel

(b) Resistance & conductance :-

Resistance	Conductance
* It is a property of a conductor which tells us how much the resistor resist or opposes the current to pass through it.	It is a property of a conductor which tells us how much the resistor allows the current to pass through it.
* Unit :- ohm (Ω)	unit :- siemens (S)
* Depend on resistivity of material	Depends on conductivity property of material.

(c) Power & Energy :-

Power	Energy
* It is the rate at which work is done, or energy is transmitted.	It is the capacitor to do work. Energy is power integrated over time.
* Unit :- Joules = watt-second	watt = joules / second
* Symbol :- W	P
* Energy can be transformed from one form to another	Power is the rate at which energy is transferred.

(d) Inductance	& Capacitance :-
* The effect of an inductor in a circuit is measured as inductance.	Each capacitor is to built to have a specific amount of capacitance.
* It is a property of a current carrying conductor which generates a M.F around conductor	It is a property of a device to hold & store electric charges.
* Unit :- Henry (H)	Farad

(e) Synchronous	Asynchronous motor.
* Machine whose rotor speed & the speed of the stator M.F is equal. $N = N_S = 120f/p$	Machine whose rotor rotates at the speed less than synchronous speed $N < N_S$.
* Does not have slip. The value of slip is zero	Have slip, Values of slip is not equal to zero.
* Efficiency is greater than Ansynchronous motor.	Less efficient
* It is costly as compared to Asynchronous motor.	Less costly