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SECTION: A

CIVIL ENGINEERING

DEPARTMENT

BASIC ELECTRO MECHANICAL ENGINEERING

MID TERM EXAM

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Question: 1

There are two well-known formulae for calculating the total resistance of parallel-connected resistances. One of these works only for two resistances while the other works for any number of parallel resistances. Write these two formulae?

Solution:

a)

Formula No 1:

$$\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \ldots$$

This formula is used for n number of resistor connected in parallel.

Formula No 2:

$$\mathbf{R} = \frac{\mathbf{R1} * \mathbf{R2}}{\mathbf{R1} + \mathbf{R2}}$$

This formula is used for 2 number of resistor connected in parallel.

Formula No 3:

$$\mathbf{R} = \frac{\mathbf{R1}}{\mathbf{2}}$$

This formula is used when you have same resistor in parallel. You need to divide it by simply 2.

b) In parallel:

When we increase no of resistors in parallel it results in;

a) R decrease with the increase of Resistor in parallel

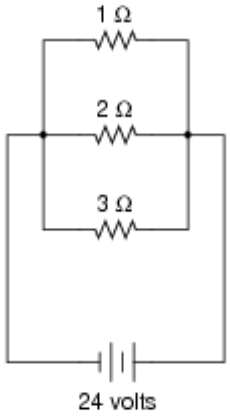
b) G increase with the increase of Resistor in parallel

Because $\mathbf{R} \propto \frac{1}{G}$

Question: 2

In the given circuit, three resistors receive the same amount of voltage (24 volts) from Single source. Calculate the amount of current "drawn" by each resistor, as well as the Amount of power dissipated by each resistor;

Solution:



R1= 3ohm

R2= 2ohm

R3= 1ohm

Calculating Current:

As I=V/R

I_1=V/R1 =24/3 =8A

I_2=V/R2 =24/2 =12A

I_3=V/R3 =24/1 =24

Now Calculating Power Dissipated:

P_1=I_1V = 8(24) = 192W

P_2=I_2V = 12(24) = 288W

P_3=I_3V = 24(24) = 576W

Question: 3

(a) Current & Voltage.

Current	Voltage
Rate of flow of electric charge is current.	It is the potential difference between two points.
Voltage is denoted by "A".	Voltage is denoted by "V".
Unit of Current is Amphere.	Unit of voltage is Volts.
Current divide in Parallel and remain same in Series components	Voltage divide in series and remain same in parallel components
Current is measured by Ammeter.	Voltage is measured by Voltmeter
I=V/R	**V=IR**

(b) Resistance & Conductance.

Resistance	Conductance
opposition that a substance offers to the flow of electric current	Degree at which an object conducts electricity OR how easy current can flow through a material.
Denoted by "R".	Denoted by "G".
Resistance is measured by Ohmmeter.	Reciprocal of Resistance is Conductance.
R=V/I	**G=I/V=1/R**
Unit of Resistance is "Ohm"	Unit of Conductance is "Siemens"

(c) Power & Energy

Power	Energy
How fast energy is used or transmitted is Power	Ability to do work is energy.
Power is vector Quantity.	Energy is Scalar Quantity.
The base unit of power is the watt	The base unit of energy is the joule.
Denoted by "P"	Denoted by "E"
P=IV	**E=FS**

(d) Inductance & Capacitance

Inductance	Capacitance
Inductance is used to store energy in form of magnetic field	Ability to store energy in form of electric charge
It resists changes in current	It resists changes in Voltage
Unit of inductance is "henry"	Unit of capacitance is "Farad"
$L=N\varphi/I$	**Q=CV**
Current lags voltage by $\pi/2$	Voltage lags current by $\pi/2$

(e) Synchronous motor & Asynchronous motor

Synchronous motor	Asynchronous motor
Low starting torque	Applied force does affect torque.
Not self-starting. Required additional power supply.	Self-starting. Additional power supply is not required.
N=Ns=120f/p	**N<Ns**
Slip ring and bushes are required	Slip ring and bushes are not required
Costly compared to Asynchronous motors	Not costly
Power factor can be adjusted to leading, lagging or unity	Run only at lagging power factor