

Name :- Hamza Khan Yousafzai

ID :- 7487

Subject :- Basic Electromechanical Engineering

Semester :- 12<sup>th</sup> , Batch 2014

Submitted to :- Engr. Syed Ashraf Ali

Midterm Exam



Qno 1

(a)

There are two well known formula 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 formula.

Ans

For Two numbers:-

$$\Rightarrow \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

For Any numbers:-

$$\Rightarrow \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_n}$$

(b)

With parallel resistances the number of total resistance decreases since the total resistance is in reciprocal form so it divides into



intervals as shown below

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

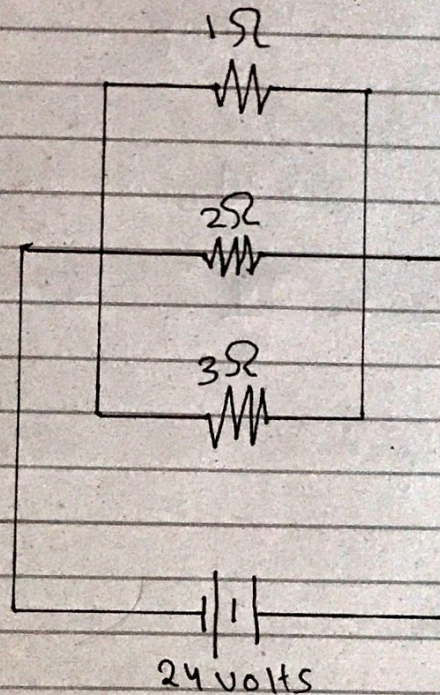
While the total conductance will increase because total conductance is reciprocal of total resistance so there is smooth or more flow of electrons

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



Qno2:-

In 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 dissipated by each resistor;



Since  $R_1$  is in parallel so

$$= \frac{1}{R_1}$$

$$\text{Thus } I_1 = \frac{V_1}{R_1}$$

$$I_1 = \frac{24}{1} = 24 \text{ amp}$$



As  $R_2$  is in series so

$$= R$$

$$\text{Thus } I_2 = \frac{V_2}{R_2}$$

$$I_2 = \frac{24}{2} = 12 \text{ amp}$$

→ As  $R_3$  is in parallel series so

$$I_3 = \frac{V_3}{R_3} = \frac{24}{3} = 8 \text{ amp}$$

→ Power dissipated by each resistor

$$P = VI$$

$$P_1 = V I_1$$

$$P_1 = 24 \times 24 = \boxed{576 \text{ W}}$$

$$P_2 = ~~R_2~~ V I_2$$

$$P_2 = 24 \times 12 = \boxed{288 \text{ W}}$$

$$P_3 = V I_3$$

$$P_3 = 24 \times 8 = \boxed{192 \text{ W}}$$



Qno3:-

Differentiate between the following

(a)

Voltage

Current

- |   |   |
|---|---|
| ① Difference between two points of an electric field        | • Flow of charges between two points            |
| ② Units is Volt   | • Unit is ampere                                |
| ③ Symbol is V   | • Symbol is I                                   |
| ④ Formula voltage = $\frac{\text{Workdone}}{\text{Charge}}$ | • Current = $\frac{\text{charge}}{\text{Time}}$ |
| ⑤ Magnetic field is created                                 | • Electrostatic field is created                |
| ⑥ Types - Alternating Voltage & Direct Voltage              | • Alternating Current & Direct current          |
| ⑦ Produces Alternator                                       | • Produces Voltage                              |
| ⑧ Measuring instrument<br>A Voltmeter                       | • Measuring instrument<br>Ammeter               |

(b)

Resistance

Conductance

- |   |  |
|---|--|
| • Resistance is a property of conductor which tells us how much the resistor resists or opposes the current to pass through it. | • Conductance is a property of a conductor which tells us how much the resistor allows the current to pass through it. |
| • Resistance is blockade  | • Conductance is allowing flow or pass.  |



• Cond

• Resistance depends on resistivity of the material

• Conductance depends on conductivity property of material

(c)

Power

Energy

① Power is the rate at which work is done, or energy is transmitted

• Energy is the capacity to do work. Energy is power integrated over time

② Unit  $\rightarrow$  ~~joule~~  
watt = Joules / second

• Unit  $\rightarrow$   
joules = watt-seconds or  
Joules = newton-meter

③ Its symbol is P

• Symbol is W

(d)

Inductance

Capacitance

① Blocks Alternating Current

• Blocks direct current

② Passes Direct Current

• Passes Alternating current

③ Current in a inductor cannot change instantly

• Voltage in capacitor cannot change instantly

④ Quick Current change produces large voltage

• Quick voltage change produces large current

⑤ Stores Energy in magnetic field

• Store Energy in electric field



Synchronous Motor	Asynchronous Motor
<p>① Synchronous motor is a machine whose rotor speed and speed of the stator magnetic field is equal <math>N = N_s = 120f/p</math></p>	<p>Asynchronous motor is a machine whose rotor rotates at speed less than the synchronous speed <math>N &lt; N_s</math></p>
<p>② Brushless motor, variable reluctance motor, switched reluctance motor</p>	<p>AC induction motor is known as the asynchronous motor</p>
<p>③ Does not have slip. The value of slip is zero</p>	<p>Have slip therefore the value of slip is not equal to zero</p>
<p>④ It requires an additional DC power source to initially rotate the rotor near to the synchronous speed</p>	<p>It does not require any additional starting source.</p>
<p>⑤ Synchronous motor is costly</p>	<p>Less costly</p>
<p>⑥ Efficiency is greater than asynchronous motor</p>	<p>Less efficient.</p>
<p>⑦ Not self starting</p>	<p>Self starting</p>