

IQRA NATIONAL UNIVERSITY

Mid Term Paper / Summer 2020

Basic electro mechanical Engineering

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Q. 1

(a) There are two well-known
----- formulae.

Two formula for finding total
resistance in parallel

$$1) \frac{1}{R_{Tot}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \text{ --- etc.}$$

This formula does not give you
the total resistance R_{Tot} . It
gives you the reciprocal of
 R_{Tot} or $\frac{1}{R_{Tot}}$.

$$(2) R_{Tot} = \frac{R_1 \times R_2}{(R_1 + R_2)}$$

This formula is often
referred to as "product
over sum".

(2)

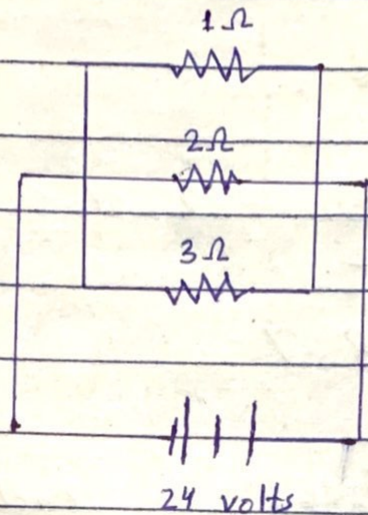
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(b) A quantity often useful — — — — — resistors.

In the addition of parallel resistors in parallel circuit resistance decreases and conductance increases with the addition of more resistors.

Q2:- In the given circuit, three resistors.



Given data

$$\text{Voltage} = V = 24\text{V}$$

$$\text{Resistor} = R_1 = 1\Omega$$

$$\text{Resistor} = R_2 = 2\Omega$$

$$\text{Resistor} = R_3 = 3\Omega$$

Required

$$I = ? , P = ?$$

Sol:-

$$V = 24\text{V}$$

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

(4)

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$$= \frac{24}{1}$$

$$I_1 = 24 \text{ A}$$

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

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

Power dissipated by each resistor.

$$P = VI$$

$$P_1 = V I_1$$

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

$$P_2 = V I_2$$

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

$$P_3 = V I_3$$

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

Q3:- Differentiate between the following:

(a) Current

Voltage

- | | |
|--|---|
| 1. Current is the rate at which electric charge flows past a point in a circuit. In other words, current is the rate of flow of electric charge. | Voltage, also called electromotive force, is the potential difference in charge b/w two points in an electrical field. In other words, voltage is the energy per unit charge. |
| 2. Current Unit is "A" or amps. | Voltage Unit is V or voltage. |
| 3. Its measuring instrument is Ammeter | Its measuring instrument is Voltmeter |
| 4. SI Unit is 1 ampere = 1 Coulomb/second | SI Unit is 1 Volt = 1 joule/coulomb
($V = W/C$) |
| 5. Field created A magnetic field | An electrostatic field. |

(b) ResistanceConductance

- 1) Resistance is a property of a 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:

The resistance R of a conductor is defined as the ratio of the potential difference V across it to the current I flowing through it.

$$\text{resistance} = \frac{\text{P.d. across conductor}}{\text{current through conductor}} \quad R = \frac{V}{I}$$

Conductance:

- => The reciprocal of resistance.
- => Symbol is $G = 1/R$
- => "Conductance" as a term is not used much in wired circuits but is used extensively in circuits involving solutions.

(c) PowerEnergy

- | | |
|---|--|
| 1) Power is the rate at which energy is transferred. | Energy is what makes change happen and can be transferred from one object to another. Energy can also be transformed from one form to another. |
| 2) The Unit used to measure this is watt or joules per second | The unit used to measure energy is Joules or watt-seconds |
| 3) The symbols used to denote power is P. | "W" is the symbol which denotes energy. |
| 4) Power cannot be transformed from one type to another. | Energy changes from one form to another. |
| 5) It is an instantaneous quantity | Energy is a time quantity or component. |

(d) InductanceCapacitance

- 1) Inductance is a property of current carrying conductors which generates a magnetic field around the conductor.
 - 2) Inductance is measured by Henry (H) and is symbolized as L .
 - 3) Inductance is the dominating component in low-pass filters.
- 1) Capacitance is the ability of a device to store electric charges.
 - 2) Capacitance is associated with capacitors. There are several types of capacitors used in circuits.
 - 3) Capacitance is the dominating component in high-pass filters.

(e) Synchronous motor	Asynchronous motor / Induction motor
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- | | |
|--|---|
| 1) Construction is complicated | Construction is simpler, particularly in case of cage rotor |
| 2) Separate DC source is required for rotor excitation. | Rotor gets excited by the induced e.m.f. so separate source is not necessary. |
| 3) Speed control is not possible | Speed control is possible though difficult |
| 4) Motor is sensitive to sudden load changes and hunting results | Phenomenon of hunting is absent. |