# MID TERM EXAM

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Subject:. Basic Electromechanical Engineering.

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Q1/ a).. Formula for calculating the total resistance of a parallel connected resistances.

* For more then two number of resistors in parallel.

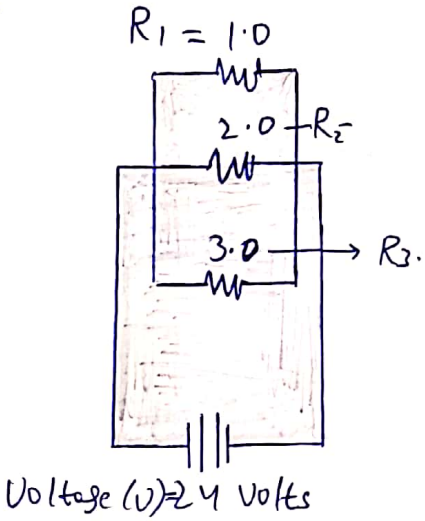
1/. $R_{eq} = \frac{1}{1/R_1 + 1/R_2 + \cdots\cdots + 1/R_N}$

* For Two parallel resistors.

1/. $R_{eq} = \frac{R_1 \times R_2}{(R_1 + R_2)}$

Q1/b. In the addition of parallel resistor in parallel circuit resistance decreases and conductance increases with the addition of more resistors.

Q No:2. Given Data:




$I_1 = 24A$

$I_2 = 12A$

$I_3 = 8A$.

Voltage (V) = 24 V.

Resistor ($R_1$) = 1 Ω

Resistor ($R_2$) = 2 Ω

Resistor ($R_3$) = 3 Ω

* **Required:**

I (Current) = ?

Power Dissipated (P) = ?

* **Solution:**

We know that,

$V = IR$.

$$I = \frac{V}{R}.$$

So,

$$I_1 = \frac{V}{R_1} \rightarrow (equ i).$$

Putting values in equ i).

$$I_1 = \frac{24}{1}, \quad \boxed{I_1 = 24A}$$

$$I_2 = \frac{V}{R_2} \rightarrow \text{equ(ii)}.$$

Putting values in equ (ii).

$$I_2 = \frac{24}{2}.$$

$$\boxed{I_2 = 12A}$$

And,

$$I_3 = \frac{V}{R_3} \rightarrow \text{equ (iii)}.$$

Putting values in equ (iii).

$$I_3 = \frac{24}{3}.$$

$$\boxed{I_3 = 8A}$$

Now. Power Dissipated by each resistor.

We know that,

$P = VI$.

So,

$P_1 = V_1 I_1 \rightarrow$ equ (4)

Putting values in equ (4)

$P_1 = 24 \times 24$

$$\boxed{P_1 = 576W}$$

Now,

$P_2 = V_1 I_2 \rightarrow$ equ (5).

Putting values in equ (5).

$P_2 = 24 \times 12$

$\boxed{P_2 = 288\,W}$

Now,

$P_3 = V_1 I_3 \rightarrow$ equ (6).

Putting values in equ (6).

$P_3 = 24 \times 8$

$\boxed{P_3 = 192\,W}$

Q.No: 3):. A):. Differentiate Between the following.

## Current And Voltage:.

| Differentiating Property. | Voltage | Current |
|---|---|---|
| 1): Definition. | It is also called electromotive force is simply the energy per unit charge. In other words, Voltage is the difference in electric potential between two points | Current is just the rate of flow of electric charge. In simple words, the current is the rate at which at which electric charge flows in a circuit at a particular point. |
| 2): Unit. | The SI unit of voltage is volts (V) 1 Volt = 1 Joule/coulomb | The SI unit of current is Ampere (A) 1 Ampere = 1 coulomb/sec. |
| 3): Denotation. | Voltage is denoted by "V" | Current is denoted by "I". |
| 4): Measuring Instrument. | It can measured by Voltmeter. | It can measured by Ammeter. |

| | | | |
|---|---|---|---|
| 5). | Inter-relation. | Voltage is the cause of the current. | Current is the effect of the voltage i.e. current cannot flow without voltage. |
| 6). | Formula. | $V = \frac{\text{Work done}}{\text{Charge}}$. | $I = \frac{\text{Charge}}{\text{Time}}$. |
| 7). | Loss | The loss of ~~charge~~ voltage occurs due to impedance. | The loss of current occurs due to the passive elements. |
| 8). | Field created. | Voltage creates an electrostatic field. | Current creates a magnetic field. |
| 9). | Change in a series connection. | In a series connection, voltage changes, it gets distributed over all the components. | In a series ~~connection~~ connection, the current remains the same through all the components. |
| 10). | Change in a parallel Connection | In a parallel connection, the voltage remains the same across all the components. | In a parallel connection, current changes. i.e it gets distributed over all components. |

QNo:. 3) b).. Resistance And Conductance.

## Resistance:.

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

$$\text{Resistance} = \frac{\text{P.d across Conductor}}{\text{Current through conductor.}}$$

$$R = \frac{V}{I}.$$

P.d = Potential difference

The resistance of a conductor depends on its length and thickness.

## * Conductance:.

→ Conductance is 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 solution.

→ Units are Siemens.

→ In ~~Pato~~ Past its Unit were Ohm$^{-1}$ and mho.

→ In Present its unit are I is the siemens.

1 Siemen = 1 ohm$^{-1}$ = 1 mho.

Q(3) c).. Energy And Power:..

| | Energy | Power. |
|---|---|---|
| 1). | Energy is defined as the capacity to do some work. It is the power with is integrated over time | Power is defined as the rate at which a specific work is done, or which the energy is transmitted. |
| 2). | Its unit is Joule or watt-seconds. | Its unit is watt or Joules per second. |
| 3). | "W" is the symbol which denotes energy. | The symbol used to denote Power is "P". |
| 4). | Energy changes from one form to another. | Power cannot be transformed from one type to another. |
| 5). | Various types of energy are kinetic, thermal, potential, gravitational, sound, electromagnetic, light, elastic etc. | Different kind of power are electric power, optical power, human power etc. |

Q No: 3). d).. Inductance And Capacitance:.

## Inductance

→ The Effect of a inductor in a circuit is measured of Inductance "L".

→ The changing current produces a changing field which produces a changing flux. i-e. $\Phi \propto I$.

→ The constant of propotionality is the inductance L.

So $\Phi = L \times I$.

## Capacitance.

→ Each capacitor is built to have a specific amount of capacitance.

→ The capacitance of a capacitor tells how much charge it can store.

→ More capacitance means more capacity to store charge.

→ Standard Unit of Capacitance is called the "farad". which is abbreviated as "F".

Q.No:3) e). Synchronous Motor and Asynchronous Motors.

| Synchronous Motor. | Induction / Asynchronous Motor. |
|---|---|
| 1). Construction is complicated. | Construction is simple, particularly is case of case rotor. |
| 2). Not Self starting | Self starting. |
| 3). Separate DC source is required for rotor excitation. | Rotor gets excited by the induced e.m.f so separate ~~source~~ source is not necessary. |
| 4). The speed is always synchronous irrespective of the load. | The speed is always less then synchronous but never synchronous. |
| 5). Speed Control is not possible. | Speed Control is possible difficult. |
| 6). As load increases, load angle increases, keeping speed constant at synchronous. | As load increasing, the speed keeps on decreasing. |

| | |
|---|---|
| 7). By changing excitation, the motor p.f can be changed from lagging and leading. | It always operates at lagging p.f and p.f control is not possible. |
| 8). It can be used as synchronous condenser for p.f improvement. | It cannot be used as synchronous condenser. |
| 9). Motor is sensitive for sudden load changes and hunting results. | Phenomena of hunting is absent. |
| 10). Motor is costly and requires frequent maintenance. | Motor is cheap. especially cage rotors and maintenance free. |