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Autonomous College :: Aided College of Govt. of AP

NAAC 'A' Grade College

Vuyyuru, Krishna (Dt).,Andhra Pradesh-521165

VALUE ADDED COURSE

TITLE: ELECTRICAL MOTOR WINDING

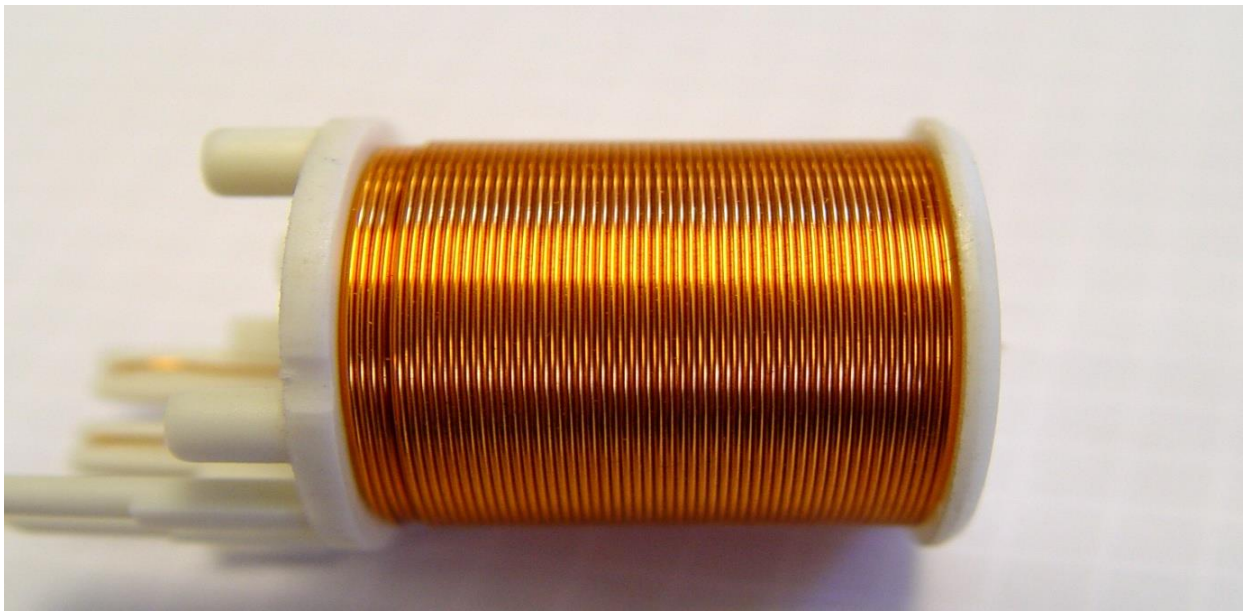
VAC CODE: PHYV3C

On 15th FEB 2021TO 18th MAR 2021

Duration of the Course: 30 Days

Organized By

Department of PHYSICS



A.G. & S.G. Siddhartha Degree College of Arts & Science
Vuyyuru-521165, Krishna District, Andhra Pradesh
(Managed by: Siddhartha Academy of General & Technical Education, Vijayawada-10)
An Autonomous College in the Jurisdiction of Krishna University
Accredited by NAAC with "A" Grade

2020-2021

DEPARTMENT OF PHYSICS

Value Added Course/ Certificate Course

Title: Electrical Motor Winding

Name of the Lecturer	:	M. Sateesh
Class	:	II MPCs
Duration of the Course	:	Thirty Days
VAC Code	:	PHYV3C

Objectives: An AC motor is an electric motor that uses alternating current to produce mechanical energy using magnetism blended with alternating current. The main benefit of an AC motor is its ability to produce constant torque up to the rated speed. DC motors are prized for their speed control and output range.

Methodology :

Teacher-centered learning

Duration: 30 Days

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Vuyyuru-521165, Krishna District, Andhra Pradesh

Value Added Course / Certificate Course

Title: Electrical Motor Winding

Date: 15/2/2021 TO 18/03/2021

Date	Content	Module No
15/2/2021 TO 21/2/2021	DC MOTORS-TOY MOTORS,FAN MOTOR,OTHER TYPES OF MOTORS	I
22/2/2021 TO 28/2/2021	AC MOTORS,DESIGN AND WORKING	II
1/3/2021 TO 8/3/2021	AC AND DC DYNAMOS ,DIFFERENT TYPES	III
9/3/2021 TO 18/9/2021	DIFFERENT CIRCUITS OF HOUSE HOLD APPLICATIONS	IV

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Value Added Course / Certificate Course 2020-21

Student Enrolment Sheet

Class: II MPCS

S. No	Roll No.	Name of the Student	Signature
1	1951601	T.Suneel Kumar	T. Suneel Kumar
2	1951604	G.Deepthi	G. Deepthi
3	1951608	O.Anil Kumar	O. Anil Kumar
4	1951609	V.Swathi	V. Swathi
5	1951612	O.Sai Chand	O. Sai Chand
6	1951615	Y.Vijaya Lakshmi	Y. Vijaya Lakshmi
7	1951621	B.Sai Krishna	B. Sai Krishna
8	1951625	P.Jaya Lakshmi	P. Jaya Lakshmi
9	1951630	P.Haritha Rani	P. Haritha Rani
10	1951631	B.Keerthi	B. Keerthi
11	1951637	S.Eswarkumar	S. Eswarkumar
12	1951638	B.Lavanya	B Lavanya
13	1951644	SK.Sameera Begum	SK. Sameera Begum
14	1951646	P.Geetha Sri	P. Geetha Sri
15	1951647	M.Krishna Sai	M. Krishna Sai

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Department of Physics

Value Added Course / Certificate Course

Title: Electrical Motor Winding

Marks List

Class: II MPCS

S. No	Roll No.	Name of the Student	Marks
1	1951601	T.Suneel Kumar	10
2	1951604	G.Deepthi	10
3	1951608	O.Anil Kumar	09
4	1951609	V.Swathi	09
5	1951612	O.Sai Chand	09
6	1951615	Y.Vijaya Lakshmi	10
7	1951621	B.Sai Krishna	10
8	1951625	P.Jaya Lakshmi	10
9	1951630	P.Haritha Rani	10
10	1951631	B.Keerthi	10
11	1951637	S.Eswarkumar	10
12	1951638	B.Lavanya	09
13	1951644	SK.Sameera Begum	10
14	1951646	P.Geetha Sri	09
15	1951647	M.Krishna Sai	09

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Vuyyuru-521165, Krishna District, Andhra Pradesh

Sl.No	Roll No	Student Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	1951601	T.Suneel Kumar	A	p	p	p	p	p	p	p	p	p	p	p	p	p	P	14
2	1951604	G.Deepthi	p	p	p	p	p	A	p	p	p	p	p	p	p	p	p	14
3	1951608	O.Anil Kumar	P	p	p	p	p	p	p	p	p	A	p	p	p	p	p	14
4	1951609	V.Swathi	P	p	A	p	p	p	p	p	p	p	p	p	p	p	p	14
5	1951612	O.Sai Chand	P	p	p	p	p	A	p	p	p	p	p	p	p	p	p	14
6	1951615	Y.Vijaya Lakshmi	P	p	p	p	p	p	p	p	A	p	p	p	p	p	p	14
7	1951621	B.Sai Krishna	P	p	p	p	p	p	p	p	A	p	p	p	p	p	p	14
8	1951625	P.Jaya Lakshmi	P	p	p	p	p	A	p	p	p	p	p	p	p	p	p	14
9	1951630	P.Haritha Rani	P	p	p	p	p	p	p	A	p	p	p	p	p	p	p	14
10	1951631	B.Keerthi	P	p	p	p	p	p	p	p	p	p	p	p	A	p	p	14
11	1951637	S.Eswarkumar	P	p	p	p	p	p	p	A	p	p	p	p	p	p	p	14
12	1951638	B.Lavanya	P	p	p	p	p	p	p	p	p	p	A	p	p	p	p	14
13	1951644	SK.Sameera Begum	P	p	p	p	p	A	p	p	p	p	p	p	p	p	p	14
14	1951646	P.Geetha Sri	P	p	p	p	p	p	p	p	p	p	p	p	A	p	p	14
15	1951647	M.Krishna Sai	P	p	p	p	p	p	p	p	p	p	p	p	p	p	A	14

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1	1951601	T.Suneel Kumar	A	p	p	p	p	p	p	p	p	p	p	p	p	p	p	14
2	1951604	G.Deepthi	p	p	p	p	A	p	p	p	p	p	p	p	p	p	p	14
3	1951608	O.Anil Kumar	P	p	p	p	p	p	p	A	p	p	p	p	p	p	p	14
4	1951609	V.Swathi	P	p	p	A	p	p	p	p	p	p	p	p	p	p	p	14
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9	1951630	P.Haritha Rani	P	p	p	p	p	p	p	A	p	p	p	p	p	p	p	14
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11	1951637	S.Eswarkumar	P	p	A	p	p	p	p	p	p	p	p	p	p	p	p	14
12	1951638	B.Lavanya	P	p	A	p	p	p	p	p	p	p	p	p	p	p	p	14
13	1951644	SK.Sameera Begum	P	p	p	p	A	p	p	p	p	p	p	p	p	p	p	14
14	1951646	P.Geetha Sri	P	p	p	p	p	p	A	p	p	p	p	p	p	p	p	14
15	1951647	M.Krishna Sai	P	p	p	p	p	p	A	p	p	p	p	p	p	p	p	14

Value Added Course / Certificate Course - Attendance Register

Class / Section: II MPCS Year : IInd Department : PHYSICS

Paper: Lecturer:

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Signature of the Lecturer Signature

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Vuyyuru-521165, Krishna District, Andhra Pradesh

Department of Physics 2020-2021

Value Added Course / Certificate Course

Title: Electrical Motor Winding

Feed Back Form

Name of the Student: T. Suneel Kumar

Class and Roll Number: 19SL601

16. Is the programme interested to you (Yes/No)

17. Have you attended all the session (Yes/No)

18. Is the content of the program is adequate (Yes/No)

19. Have the teacher covered the entire syllabus? (Yes/No)

20. Is the number of hours adequate? (Yes/No)

6. Do you have any suggestions for enhancing or reducing the number of weeks designed for the program? (Yes/No)

10. On the whole, is the program useful in terms of enriching your knowledge? (Yes/No)

8. Do you have any suggestions on the program? (Yes/No)

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Department of Physics

Value Added Course / Certificate Course

Title: Electrical Motor Winding

Feed Back Form

Name of the Student: G. Deepthi

Class and Roll Number: 195160H

16. Is the programme interested to you (Yes/No)

17. Have you attended all the session (Yes/No)

18. Is the content of the program is adequate (Yes/No)

19. Have the teacher covered the entire syllabus? (Yes/No)

20. Is the number of hours adequate? (Yes/No)

6. Do you have any suggestions for enhancing or reducing the number of weeks designed for the program? (Yes/No)

10. On the whole, is the program useful in terms of enriching your knowledge? (Yes/No)

8. Do you have any suggestions on the program? (Yes/No)

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Value Added Course / Certificate Course

Title: Electrical Motor Winding

Test Exercise:

1. What will happen, with the increase in speed of a DC motor?
2. Which part will surely tell that given motor is DC motor and not an AC type?
3. In DC motor, which of the following part can sustain the maximum temperature rise?
4. Direction of rotation of motor is determined by _____
5. The current drawn by the armature of DC motor is directly proportional to _____
6. Which power is mentioned on a name plate of a motor?
7. **In case of AC motor circuit, static frequency changers are used for**
8. **The motor commonly used in computers and digital systems is**
9. **When an induction motor is switched on, the rotor frequency is**
10. **In an induction motor, if the air gap is increased, its**

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Value Added Course / Certificate Course

Title: Electrical Motor Winding

Key:

1) Back emf increase but line current falls.

2) Commutators

3) Field winding

4) Fleming's left-hand rule

5) Torque

6) Output power available at the shaft

7) speed regulation

8) induction motor

9) same as supply frequency

10) power factor will decrease

3) ELECTRICAL MOTOR WINDING

Module No -1

A DC motor is defined as a class of electrical motors that convert direct current electrical energy into mechanical energy.

From the above definition, we can conclude that any electric motor that is operated using direct current or DC is called a DC motor. We will understand the DC motor construction and how a DC motor converts the supplied DC electrical energy into mechanical energy in the next few sections.

Different Parts of a DC Motor

A DC motor is composed of the following main parts::

Armature or Rotor

The armature of a DC motor is a cylinder of magnetic laminations that are insulated from one another. The armature is perpendicular to the axis of the cylinder. The armature is a rotating part that rotates on its axis and is separated from the field coil by an air gap.

Field Coil or Stator

A DC motor field coil is a non-moving part on which winding is wound to produce a magnetic field. This electro-magnet has a cylindrical cavity between its poles.

Commutator and Brushes

Commutator

The commutator of a DC motor is a cylindrical structure that is made of copper segments stacked together but insulated from each other using mica. The primary function of a commutator is to supply electrical current to the armature winding.

Brushes

The brushes of a DC motor are made with graphite and carbon structure. These brushes conduct electric current from the external circuit to the rotating commutator. Hence, we come to understand that the **commutator and the brush unit are concerned with transmitting the power from the static electrical circuit to the mechanically rotating region or the rotor.**

DC Motor Working

In the previous section, we discussed the various components of a DC motor. Now, using this knowledge let us understand the working of DC motors.

A magnetic field arises in the air gap when the field coil of the DC motor is energised. The created magnetic field is in the direction of the radii of the armature. The magnetic field enters the armature from the North pole side of the field coil and "exits" the armature from the field coil's South pole side.

The conductors located on the other pole are subjected to a force of the same intensity but in the opposite direction. These two opposing forces create a torque that causes the motor armature to rotate.

Module No -2

Types of DC motor

DC motors have a wide range of applications ranging from electric shavers to automobiles. To cater to this wide range of applications, they are classified into different types based on the field winding connections to the armature as:

- Self Excited DC Motor
- Separately Excited DC Motor

Now, let us discuss the various types of DC Motors in detail.

Self Excited DC Motor

In self-excited DC motors, the field winding is connected either in series or parallel to the armature winding. Based on this, the self-excited DC motor can further be classified as:

- Shunt wound DC motor
- Series wound DC motor
- Compound wound DC motor

Shunt wound DC motor

In a shunt wound motor, the field winding is connected parallel to the armature as shown in the figure.

Series wound DC motor

In a series wound DC motor, the field winding is connected in series with the armature winding as shown in the figure.

Compound wound DC motor

DC motors having both shunt and series field winding is known as Compound DC motor, as shown in the figure. The compound motor is further divided into:

- Cumulative Compound Motor
- Differential Compound Motor

In a cumulative compound motor, the magnetic flux produced by both the windings is in the same direction. In a differential compound motor, the flux produced by the series field windings is opposite to the flux produced by the shunt field winding.

Separately Excited DC Motor

In a separately excited DC motor, the field coils are energised from an external source of DC supply as shown in the figure.

Brushed DC Motor vs Brushless DC Motor

A brushless DC motor, also known as synchronous DC motor, unlike brushed DC motors, do not have a commutator. The commutator in a brushless DC motor is replaced by an electronic servomechanism that can detect and adjust the angle of the rotor.

A brushed DC motor features a commutator that reverses the current every half cycle and creates single direction torque. While brushed DC motors remain popular, many have been phased out for more efficient brushless models in recent years.

Applications of DC Motor

The applications of different types of DC motors are listed below:

Shunt DC Motors

Owing to the fairly constant speed and medium starting torque of shunt DC motors, they are used in the following applications:

1. Centrifugal and reciprocating pumps
2. Lathe machines
3. Blowers and Fans
4. Drilling machines
5. Milling machines
6. Machine tools

Series DC Motors

Owing to the high starting torque and variable speed of series DC motors, they are used in the following applications:

- Conveyors
- Hoists, Elevators
- Cranes
- Electric Locomotives

Cumulative Compound DC motors

Owing to the high starting torque of cumulative compound DC motors, they are used in the following applications:

- Shears
- Heavy Planers
- Rolling mills
- Elevators

What is an AC Motor?

An AC motor is a motor that converts alternating current into mechanical power. The stator and the rotor are important parts of AC motors. The stator is the stationary part of the motor, and the rotor is the rotating part of the motor. The AC motor may be single-phase or three-phase. Nikola Tesla invented the first AC induction motor in 1887.

Construction of an AC motor

An alternating current drives an AC motor. The stationary stator and the rotating rotor are important parts of AC motors. In this section, let us study the different parts of an AC motor.

AC Motor Diagram

Following are the different parts of an AC motor:

Stator

The stator is the stationary part of the motor that delivers a rotating magnetic field to interact with the rotor.

Stator Core

The stator core is made of thin metal sheets known as laminations. Laminations are used to reduce energy loss.

Stator Windings

Stator windings are stacked together, forming a hollow cylinder. The slots of the stator core coils of insulated wires are insulated.

When the assembled motor operates, the stator windings are connected to a power source. Each group of coils, along with the steel core, becomes an electromagnet when the current is applied.

Rotor

A rotor is a central component of a motor that is fixed to the shaft. The most common type of rotor used in an AC motor is the squirrel cage rotor. A squirrel-cage rotor is cylindrical and is

made by stacking thin steel laminations.Instead of inserting wire coils between the slots, conductor bars are die-cast into the evenly spaced slots around the cylinder. Once the conductor bars are die-casted, they are electrically and mechanically connected to the end rings.

Motor Shaft

The rotor is pressed onto a steel shaft to form a rotor assembly. The shaft extends outside the motor casing allowing connection to an external system to transmit the rotational power.

Bearings

Bearings hold the motor shaft in place. The bearings minimize the shaft's friction connected to the casing, which increases the motor's efficiency.

Enclosure

The enclosure protects the internal parts of the motor from water and other environmental elements. The enclosure consists of a frame and two end brackets.

Module No - 3

Classification of AC Motor

Below, we have discussed the different types of AC motors in detail.

Based on the principle of operation, AC motors are classified as:

- Synchronous Motor
- Induction Motor

Synchronous Motor

The motor that runs at synchronous speed is known as the synchronous motor. The constant speed at which the motor generates the electromotive force is known as synchronous speed. An electromagnet in the rotating magnetic field magnetically locks itself with the rotating magnetic field and rotates simultaneously with the rotating field. This is where the name synchronous motor comes from. This also means that synchronous motors have fixed speeds. The synchronous speed can be calculated using the following formula:

Working Principle of a Synchronous Motor

- The synchronous motor works with two electrical inputs provided to it.
- The stator is equipped with a 3-phase AC supply, while the rotor is provided with the DC supply.
- The stator winding supplied with 3 phase AC supply generates 3 phase rotating magnetic flux. The rotor carrying DC supply produces a constant flux.

- At a particular instant, the rotor and the stator poles might be of the same polarity (N-N or S-S), causing a repulsive force and the very next second, it will be N-S causing an attractive force.
- Due to this attractive and repulsive force, the motor cannot rotate in any direction and remains in a standstill position.
- To overcome this resistance to motion, the rotor is initially fed mechanical input that rotates it in the same direction as the magnetic field. After some time, magnetic locking occurs, and the synchronous motor rotates in synchronism.

Induction Motor

Induction motors are the most commonly used motors. Induction motors are also known as asynchronous motors because they always run slower than synchronous speed.

Based on the type of rotor construction, they are divided into two types as follows:

- **Squirrel Cage Motor**
- **Slip Ring Motor**

Working Principle of Induction Motors

- In an induction motor, the stator winding is fed with an AC supply. This causes the stator winding to develop an alternating flux. We call this rotating flux "Rotating Magnetic Field (RMF)."
- According to Faraday's Law of Electromagnetic Induction, the relative speed between the stator RMF and the rotor RMF causes an induced emf in the rotor conductors. Rotor conductors are short-circuited, and a rotor current is produced due to induced emf.
- This induced current produces alternating flux around it. It should be noted that the stator flux lags behind the rotor flux.
- Due to the relative velocity between the rotating stator flux and the rotor, the rotor rotates in the same direction as that of the stator flux to minimize the relative velocity. This is the basic working principle of the induction motor.
- The difference between the synchronous speed (N_s) and the actual speed (N) of the rotor is known as the slip.

Applications of AC Motors

AC motors are a preferred source of supply due to the following reasons:

Longevity

With only a few moving parts, AC motors have the potential to last for years. The durability of AC motors makes them a preferred solution for field applications such as agricultural equipment and commercial applications such as vending machines.

Efficiency

The speed-to-torque characteristics of AC motors allow them to provide excellent performance in many applications without overheating, degeneration or braking. This is why an AC motor is chosen for high-demand applications such as pumps and packaging equipment.

Quiet Operation

Producing less noise, AC motors are ideal for applications in stores, hospitals and restaurants.

Availability

AC motors are available in a wide range of sizes and power outputs. This wide range makes it ideal for many applications.

DIFFERENCES BETWEEN AC AND DC GENERATORS:

1	**Definition**	AC generator is a mechanical device that converts mechanical energy into AC electrical power.	DC generator is a mechanical device that converts mechanical energy into DC electrical power.
2	**Direction of Current**	In an AC generator, the electrical current reverses direction periodically.	In a DC generator, the electrical current flows only in one direction.
3	**Basic Design**	In an AC generator, the coil through which the current flows is fixed while the magnet moves. The construction is simple and costs are less.	In a DC generator, the coil through which the current flows rotate in a fixed field. The overall design is very simple but construction is complex due to commutators and slip rings.
4	**Commutators**	AC generator does not have commutators.	DC generators have commutators to make the current flow in one direction only.
5	**Rings**	AC generators have slip-rings.	DC generators have commutators.
6	**Efficiency of Brushes**	Since slip-rings have a smooth and uninterrupted surface, they do not wear quickly and are highly efficient.	Both brushes and commutators of a DC generator wear out quickly and thus are less efficient.
7	**Short Circuit Possibility**	As the brushes have high efficiency, a short circuit is very unlikely.	Since the brushes and commutators wear out quickly, sparking and short circuit possibility is high.

8	**Rotating Parts**	The rotating part in an AC Generator is a low current high resistivity rotor.	The rotating part in a DC generator is generally heavy.
9	**Current Induction**	In an AC generator, the output current can be either induced in the stator or in the rotor.	In a DC generator, the output current can only be induced in the rotor.
10	**Output Voltage**	AC generators produce a high voltage which varies in amplitude and time. The output frequency varies (mostly 50Hz to 60Hz).	DC generators produce a low voltage when compared to AC generator which is constant in amplitude and time i.e. output frequency is zero.
11	**Maintenance**	AC generators require very little maintenance and are highly reliable.	DC generators require frequent maintenance and are less reliable.
12	**Types**	AC generators can be of varying types like 3 phase generators, single-phase generators, synchronous generator, induction generator, etc.	DC generators are mainly two types which are Separately excited DC generator and self-excited DC generator. According to field and armature connection, they can be further classified as DC series, shunt, or compound generators, respectively.
13	**Cost**	The initial cost of an AC generator is high.	The initial cost of a DC generator is less when compared to AC generators.
14	**Distribution and Transmission**	The output from AC generators is easy to distribute using a transformer.	The output from DC generators is difficult to distribute as transformers cannot be used.
15	**Efficiency**	AC generators are very efficient as the energy losses are less.	DC generators are less efficient due to sparking and other losses like copper, eddy current, mechanical, and hysteresis losses.
16	**Applications**	It is used to power smaller motors and electrical appliances at homes (mixers, vacuum cleaners, etc.)	DC generators power very large electric motors like those needed for subway systems.

Supply of Electricity

We know power generation takes place in power stations and the power distribution takes place from the power station through large transmission lines which are supported by the

large towers. These transmission lines aid in carrying a large amount of power to substations. Distribution lines carry small amounts of current which are distributed from the substations to houses. The main supply, referred to as mains, receives the power in the home and is distributed through various types of cables. When the currents flow through the cables into the devices or appliances at home, they function accordingly.

Domestic Electric Circuits

Basically, electric circuit connections are of two types:

- Series circuit
- Parallel circuit

In the series circuit electrons flow in a single direction. Series circuits can be either opened or closed at a single time. When the circuit breaks, no current flows in the circuit.

In the parallel circuit, electrons flow in several directions. Different parts of the circuit are connected in different branches. If a circuit breaks in a single direction, electric current flows in another direction.

The power supplied to homes through distribution lines are received at the mains. Electricity is supplied through two types of cables; Over head cables or underground cables.

Over Head Cables and Underground Cables

The overhead cables are usually mounted with support made of RCC, wood, steel and even reinforced plastics. The underground cables are laid by digging trenches. The cables used for the transmission and distribution of the power are known as power cables.

Assembly of one or more individually insulated electrical conductors are held together with an overall sheath. These power cables are laid inside the building as permanent wiring, buried in the ground and run overhead or exposed to the atmosphere. The design and manufacturing of power cables is as per the rated current, voltage, maximum operating temperature and usage.

Module No -4

Parts of power cable are:

• Conductor

• Insulation

• Beading

• Armoring (optional)

• Outer sheath

Conductors are usually made of copper or aluminum material and are the power carrying part of the cable.

Insulating materials incorporated in the manufacturing of cable are chosen based on the operating temperature as well as the voltage and current rating of the cable. The process by which a cable is provided with more mechanical strength is known as beading. Armoring is a process by which the earthing shield to the current carrying conductors is provided. The outermost cover of the cable that protects against electrical mishaps, weather, and chemicals. Outer sheath is made of PVC or rubber.

3 types of wires are involved in the domestic electric circuits, they are:

- Earth wire
- Live wire
- Neutral wire

Earth wire is green in colour. Earth wire is connected to metal plates placed in the earth near the house for safety purposes. It provides safety for all the appliances and devices connected at home which have a metallic body. This is done to prevent shock when leakage of charges happens in the metallic body.

Live wire is red in colour. It is a positive conductor that helps to break the circuit when excess current flows through the circuit.

Neutral wire is black in colour. It is a negative conductor.

Note: The potential difference between live and neutral wire is 220 volts.

Electric Fuse

From the main supply, the current is passed through the circuit called a fuse. An electric fuse is used as a safety device that protects electric circuits and appliances due to fluctuation, short-circuiting or overloading of the electric circuits. Fuse offers high resistance to voltage and has a low melting point. The fuse helps in breaking the circuit when overload current, high voltage or fluctuating current passes through the circuit. When heated, it melts and breaks the connection with the circuit, helping in preventing burning of other components/circuits. Hence, fuse is an integral part of domestic wiring as a safety device.

Electric Meter

Fuse is connected to an electric meter, an electric meter is also known as an energy meter. The earth wire from the meter is connected to ground (earthend) near the house. This meter records the electricity consumed by the house in kilowatt hour (kwh). The wires from the electric meter pass to the distribution box and are distributed to various devices when connected to the switch.

Electric circuits used for household purposes are of two types: 15 Amperes current rating circuit and 5 Amperes current rating circuit.

5 Amperes current rating circuits are used for lower power consumption sources that have lower power ratings. It includes television, fans, lights like LED and bulbs.

15 Amperes current rating circuits are used for higher power consumption sources that have a high power rating. It includes an air conditioner, geysers and iron box.

Now let us know various factors like overloading and short-circuiting that affect the flow of electricity and interrupt the normal functioning of the devices.

Overloading and Short-Circuiting

The main reason for using the electric fuse is to prevent overloading and short-circuiting. When these occur, mishaps like circuit burning, fire and shock which can lead to severe hazard can take place.

When a number of electrical appliances are used at the same time, it draws a huge amount of current at the same time. This causes overloading. Even when a number of electrical appliances are connected to the same electrical socket, overloading takes place. Since we can see a parallel type of connection in residential buildings, when the total current drawn by all the appliances at the single time exceeds the bearing capacity of the wire, it heats the wire and leads to overloading.

Short-circuit happens when the neutral wire comes in contact with the live wire. It happens when wires of low resistance are used or when the insulation of the wire is damaged and one wire gets in contact with another.

Earthing

We might experience a mild shock when we come in contact with devices that have damaged insulation or when touched with wet hands or when the body comes in contact with the metallic part of the device. When the leakage of current takes place, current flows through the body of the person in contact. To avoid this type of situation, as a part of safety and precaution, earthing is done. Earthing is the process of protecting against unwarranted spikes and bouts of electricity that can cause damage to life and property.

Precautions

We have to make sure we follow some precautions while handling electrical equipment.

- Ensure a good earthing is done in the house.
- A good quality of fuse shall be incorporated into the electrical circuit.
- High resistance, insulated wires should be used in the electrical wiring of the house.
- Sockets and switches also should be of specified industrial standards.
- Do not touch electrical equipment with wet hands.
- When any electrical hazards happen, make sure to turn off the main supply immediately.

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Conducted by the Department of Physics from 15-02-2021 to 18-03-2021. We wish him/her bright future

Co-ordinator *Head of Department* *Principal*