

Aim:-

Study the following

- 1.1 Existing electrical power system with their factors.
- 1.2 Electrical parameter
- 1.3 Electrical measuring instruments.

Theory:

1. (Existing electrical power system with their factors.)

Nowadays the electricity has become a fundamental element of the life of human beings and day by day the demand of it is increasing with the modern life style of them. So it is necessary to know about different aspects of electricity like type of electricity, how it generate and available at our side? and etc.

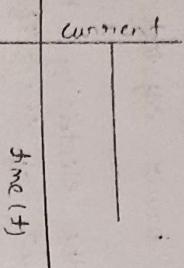
1.1 Types of Electricity:

Broadly as according direction and variation of magnitude of electricity, it classified in to two following classes:

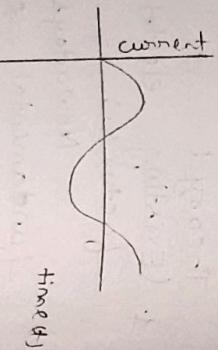
1. Direct current (DC)
2. Alternating current (AC)

Direct current

DC stands for direct current. The electricity or current which is magnitude does not vary with time but carry a constant value is known as direct current

Alternating current

AC stands for Alternating current, which is magnitude varies alternating with a certain period with time is known as Alternating current.

Source of generation

Batteries, Cells, DC Generators

AC Generation
(Alternator)Applications

Mostly it uses at low power level like cell phone toys, electronics devices like TV, computer and etc.

Applications

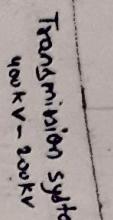
mostly it uses at high power level like motor, fan, industrial and etc.

- In figure 1.1, when the shaft of generator rotates, conductor linking magnetic field will change. So electricity will produce.
- There are various methods to rotate the shaft of generators,
 - If high pressure steam falls on turbine blades which is connected to the shaft of generator, then electricity will produce. If steam is generated by means of water and burning of coal, then these power plant is known as "Coal power plant".
 - If steam is generated by means of water and heat of nuclear energy, then these power plants is known as "Nuclear power plant".
- If water fall from a height on the blade of turbine which are connected to the shaft of generator, then these power plant is known as "Hydro power plant".

large generators - thermal,
hydro, nuclear
(11kV to 33 kV)

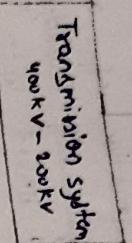


Step up transformer.



Tie-line to other system
400 kV - 200 kV

Step down transformer



33 kV via different power plants

iii Generation:-

Generation is the component which is

generated Electric power in the range of 11kV or
33 kV via different power plants.

iii Transmission:-

Electrical power is increased by stepped
up Transformers and transmitted at high voltage
range (400 kV to 200 kV) through conductor which is
known as transmission line.

iii Distribution:-

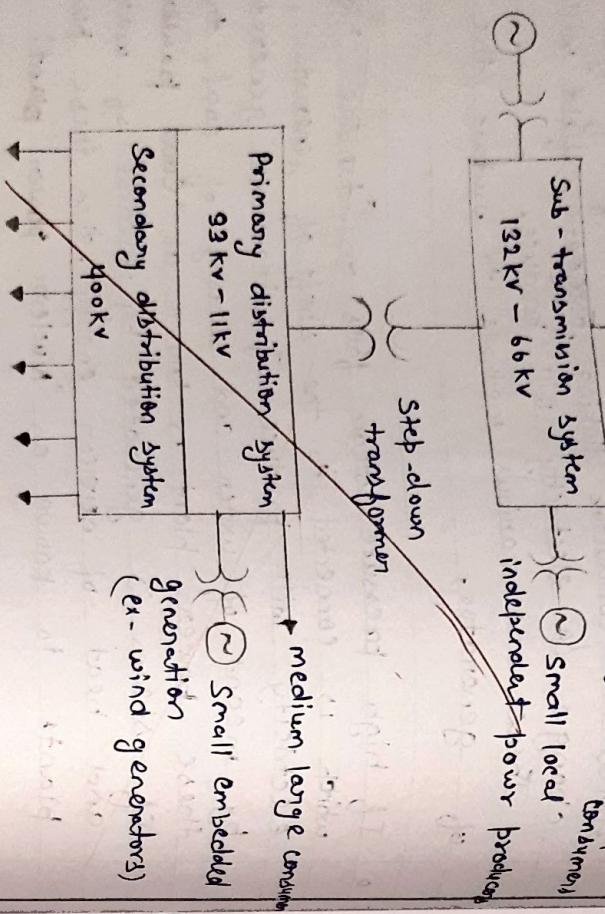
Distribution system is mainly responsible
for the conveyance of this power to the consumers.
At this point, Electric Power is decreased up to 230V
by stepped down transformers.

Small consumers (400V three phase or 230V per phase)

Q. (Electrical parameters)

parameters of a system which are
described the system. There are various parameters in

Basic Structure of electric Power System



electrical system.2.1 Current

- Flow of charge per unit time.
- Unit - Ampere or Coulomb/sec.
- Represented by 'A'.
- measured by Ammeter.

2.2. Voltage

- Work done per unit charge.
- Unit - Voltage or Joule/coulomb.
- Represented by 'V'
- measured by voltmeter.

2.3 Power

- Electric power is the rate at which work is done or energy transformed into an electrical circuit.
- It is also a product of voltage and current.
- Unit - watt or Joule/sec.
- Represented by 'P'.
- measured by wattmeter.

2.4 Energy

- Product of power and time.
- Unit - Kwhr
- measured by Energy meter.

2.5 Resistance or Resistor

- Ability of material which oppose the flow of current is called resistance.

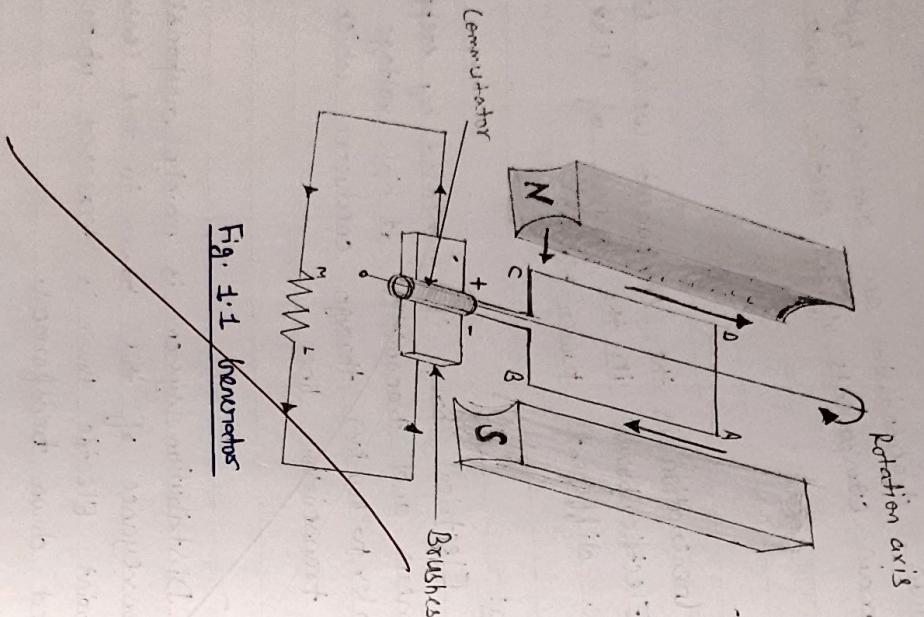
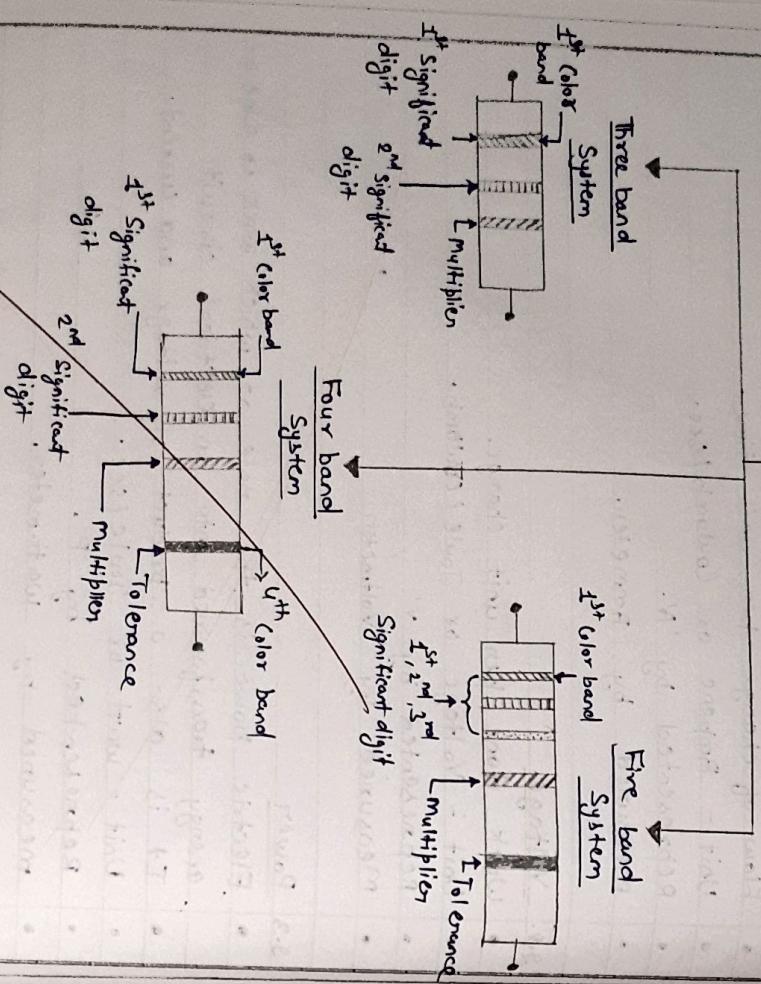


Fig. 1.1 Generator

The color coding method is explained as below.

Color (Bands) Code.



2.6 Color coding of resistor

Color code and its value, multipliers

B --- Black $\rightarrow 0 \times 10^0$

Bx --- Brown $\rightarrow 1 \times 10^1$

R --- Red $\rightarrow 2 \times 10^2$

O --- Orange $\rightarrow 3 \times 10^3$

Y --- Yellow $\rightarrow 4 \times 10^4$

G --- Green $\rightarrow 5 \times 10^5$

B --- Blue $\rightarrow 6 \times 10^6$

V --- Violet $\rightarrow 7 \times 10^7$

G --- Gray $\rightarrow 8 \times 10^8$

W --- White $\rightarrow 9 \times 10^9$

Colour coding for transistor

Multiplicants, Tolerance

Bx --- Brown $\rightarrow \pm 1\%$

R --- Red $\rightarrow \pm 2\%$

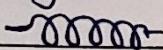
G --- Green $\rightarrow \pm 5\%$

S --- Silver $\rightarrow \pm 10\%$

No color $\rightarrow \pm 20\%$

Pink --- \rightarrow High stability

2.7 Inductance or Inductor

- Ability of material which opposes the flow of change in current is called inductance and the element which shows these properties known as inductor.
- Unit - Henry.
- Represented by 'L'.
- Symbol 
- Stores magnetic energy.

2.8 Capacitance or capacitor.

- It is a device which oppose change in voltage or stores electrical.
- Unit - Farad.
- Represented by 'c'
- Symbol 
- Stores electric energy.

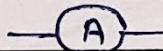
3. (Electrical measuring instruments)

For a desired output from a system, it is necessary to measure the parameters of the system. Similarly in electrical system, there is also measure the electrical parameters (Voltage, Current, Power and etc.) via some instruments which are known as Measuring instruments.

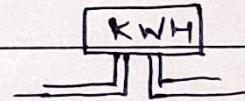
3.1 Voltmeter

- Measure the potential difference across any two points of a circuit.
- Connected in parallel across any element in the circuit.
- The resistance of voltmeter is kept very high.
- Symbol of voltmeter 

3.2 Ammeter

- Measure of current in a circuit.
- Connected in series in the circuit.
- Resistance of the ammeter should be as low as possible.
- Symbol of ammeter 

3.3 Energy meter

- Measure the energy utilized by the electric load. The energy is the total power consumed and utilized by the load at a particular interval of time.
- Used in domestic and industrial AC circuit for measuring the power consumption.
- Symbol of ammeter Energy meter 

3.4 Multi-meter

- Used to measure the current, voltage and resistance.
- Can be used as an Ammeter, a voltmeter, an ohmmeter, by operating a multi-position knob on the meter.
- They can measure DC as well as AC.

- There are also special functions in a multi-meter like "Defecting a short circuit", testing transistors etc.

3.5 Oscilloscope

- Also known as a scope, CRO, DSO or an O-scope.
- Types of electronic test instrument that allows observation of constantly varying signal voltages usually as a two dimensional graph of one or more electrical potential differences or currents using the vertical or 'y' axis, plotted as a function of time, (horizontal or 'x' axis).
- Used to observe the exact wave shape of an electrical signal.
- Used in the sciences, medicine, engineering and telecommunications industry.
- Originally all oscilloscopes used cathode ray tubes as their display element and linear amplifiers for signal processing.

Result

We have successfully studied about existing electrical power system with their factors, Electrical parameters, Electrical measuring instruments.

[Viva Question]

Q1 What are the components of electrical power system?

Ans Generation, transmission and distribution are the components of Electrical power system.

Q2 By which device voltage level changes in Power system?

Ans Transformer is a device that is used to change the level of voltage and also level of current.

Q3 What is current?

Ans Current can be defined as the motion of charge through a conducting material. The unit of current is Ampere. whilst charge is measured in Coulombs.

Q4 Why do we use resistor? ~~—~~

Ans The main function of resistor in a circuit is to control the flow of current to other components. Take an LED (light) for example. If too much current flows through an LED it is destroyed. So a resistor is used to limit the current.

Q5 What is difference between capacitor and inductor?

Ans The main difference between capacitor & inductor is that an inductor is used to store energy in the form of magnetic field, whereas a capacitor is used to store energy in the form of electric field.

Q6 What is digital multimeter?

Ans A digital multimeter is a test tool used to measure two or more electrical values. Principally Voltage (Volts), Current (Amps), resistance (ohms). It is a standard diagnostic tool for technicians in the electrical / electronic industries.

Q7 Define Ohm's law?

Ans Ohm's law states that the voltage across a conductor is directly proportional to the current flowing through it, provided all physical condition, pressure, temp., remains constant.

Q8 What is generator?

Ans Generator is an electrical machine which convert mechanical energy into electrical energy.

Q9 What is transmission system?

Ans Transmission system is an arrangement of wires and cables which transmit bulk electrical power from generating station to load centre.

Akanksha
18/10/2021

Q10 What is DC current?

Ans An electrical current which do not vary with time is known as DC (Direct current).

Aim :-

2.1 Adverse effect of electricity on human being.

2.2 Safety precaution while work with electricity.

Theory :-

1: (Adverse effect of electricity on human being)

As we known that electricity is the boon for our life if we do not handle it properly that it may be dangerous for our life. Now we shall study the adverse effect of electricity on human being.

1.1 Electrical Hazards :-

Three types :-

- The first and the most commonly recognized hazard is electrical shock.
- The second type of hazard is electrical burns, occurs when the body becomes part of an electrical circuit.
- The third is effects of blast.

Shock can happen in three ways.

- A person may comes in contact with both conductors in circuit.
- A person may provide a path between an underground conductor & the ground.
- A person may provide a path btw ^{Teacher's Signature} the ground and a conducting material that is in contact with an undergrounded conductor.

- * The extent of injury accompanying electric shock depends on three factors:-
 - The amount of current conducted through the body.
 - The path of the current through the body.
 - The length of time a person is subjected to the current.

The amount of current depends on the potential difference and the resistance.

1.2 Electrical Hazards's effect:-

The effect of low current on the human body ranges from a temporary mild tingling sensation to death. An electric shock can injure you in either or both of the following:

- A severe shock can stop the heart or the breathing muscles, or both.
- The heating effects of the current can cause severe burns, especially at points where the electricity enters and leaves body.
- Other effect includes severe bleeding, breathing difficulty.

The effects of electrical current are listed in Table

Current in milli Amperes	Effects
1 or less	No sensation, probably not noticed.
1 to 3	Mild sensation, not painful.
3 to 10	Painful shock.
10 to 30	Muscular control could be lost or muscle clamping.
30 to 75	Respiratory paralysis.
75 to 4 Amps	Ventricular Fibrillation
over 4 Amps	Tissue begins to burn. Heart muscles clamp and heart stop beating.

2. (Adverse effect of electricity on human being.)

The electrical engineering department is committed to providing a safe laboratory environment for all students. The EEE department requires the students, staff and faculty to adhere to basic general lab safety rules in all department operated lab.

Using laboratory equipment to perform any kind of experiments contains some elements of risk, particularly in power system labs. Safe working habits are essential for our safety and the safety of others around you.

2.1 Electrical safety Precautions:-

- No power laboratory should be performed without laboratory instructor person.
- Before equipment is made live, circuit connections and layout should be checked by the instructor.
- Never make any changes to circuits without first isolating the circuit by switching off and removing connections to supplies.
- Voltage above 50V (RMS) AC and 50V DC are always dangerous. Extra precautions should be considered as voltage levels are increased.
- Be familiar with the locations and operation of safety and emergency equipment such as emergency power off in your lab.
- Use extension cords only when necessary and only on a temporary basis.
- Do not use damaged cords, cords that become hot, or cords with exposed wiring. Inform the instructor about damaged cords.
- Know the correct handling procedures for batteries, cells, capacitors, inductors, and other high energy-store devices.
- Inform your instructors if probe equipments are left unattended. Such experiments should be isolated from the supplies.
- If for a special reason, it must be left on, a barrier and a warning notice are required.

- Equipment found to be faulty in any way should be reported immediately and not used until it is inspected and declared safe.
- If a small electrical fire occurs, try to disconnect the electrical power source, if possible.
- Do not put yourself at risk.
- Do not use water on an electrical fire.

Result :- We have successfully studied about adverse effect of electricity on human being Safety precautions while work with electricity.

Viva Questions

Q1 Give any two examples of good conductors of electricity.
Ans All metals (examples gold, copper, iron etc.) are good conductors of electricity.

Q2 Give any two examples of insulators.
Ans Examples of insulators are rubber, wood, plastic etc.

Q3 The resistance of the human body is around in wet condition.
Ans 1000 ohms.

Q4 Define good conductors and poor conductors or insulators.
Ans The materials that conduct electricity through them are called good conductors whereas those that do not conduct electricity are called poor conductors or insulators. For example, copper, brass, aluminium, iron etc. are conductors whereas rubber, plastic, wood, air etc. are insulators.

Q5 Which part of an atom is responsible for flow of current?

Ans. electron.

Q6 What should be done with the damaged tool or extension cord.

Tag it out of service and have it replaced by qualified technician.

Q7 Which part of the human body offers the most electrical resistance?

Ans The skin offer the most electrical resistance.

Q8 What is the purpose of grounding electrical system?

Ans To protect against electric shocks.

Q9 What does the term electrical insulation means?

Ans The use of protective material to prevent electrical shock.

Akanksha
25/9/19

Aim:- Study the following:

- 3.1. Tools and accessories used in House wiring.
- 3.2. Study and perform stair case House wiring.

Note
Plier

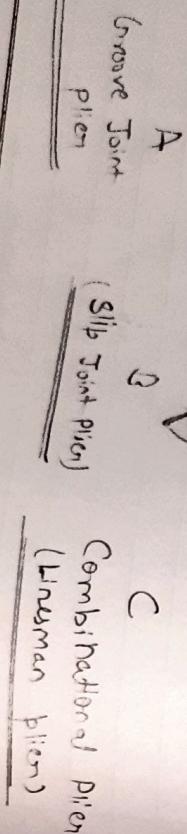
Theory:-

(Tools and accessories used in House wiring.)

Before going on electric wiring installation and repairing of a place, it is required to know about the tool and accessories used in house wiring.

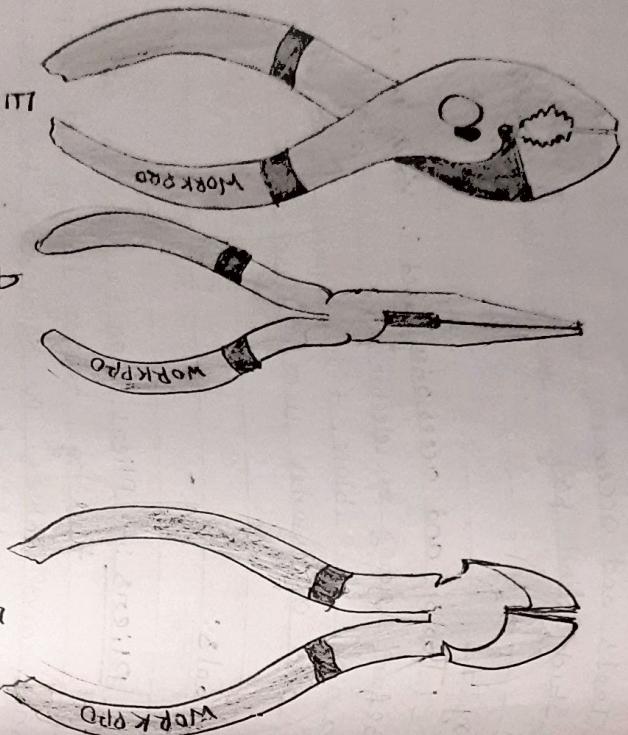
3.1 Tools:

3.1.1. Pliers :- Pliers can be used for cutting, twisting, bending, holding and gripping of wires and cables. The handle of the plier will be insulated and it can't be considered as sufficient protection. There are different types of pliers.



3.1.2 Electrical Tape :-

Used to cover and insulate a broad range of cables, wires and other materials that conduct electricity.



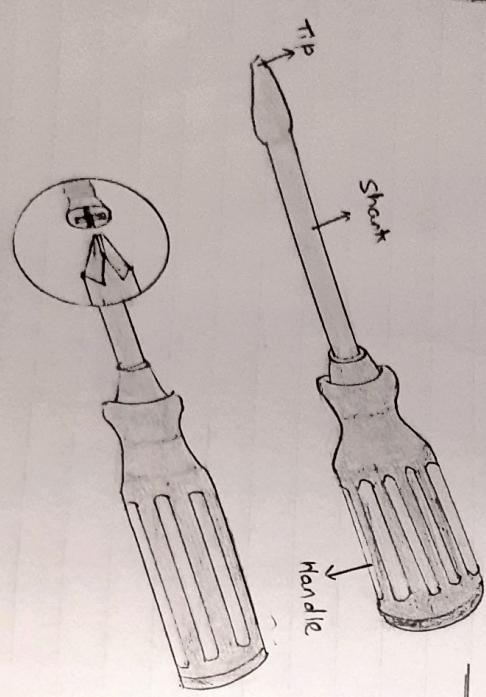
E
Side Joint plier

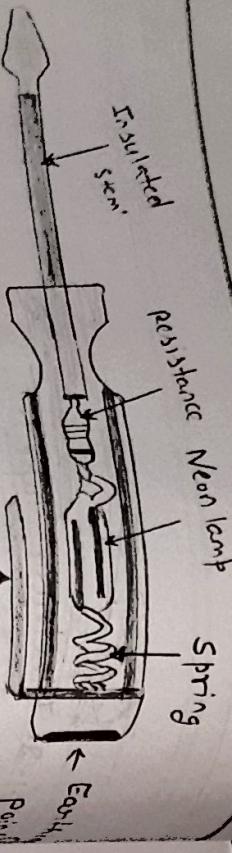
D
Nose plier

F
Diagonal plier
(Nipper)

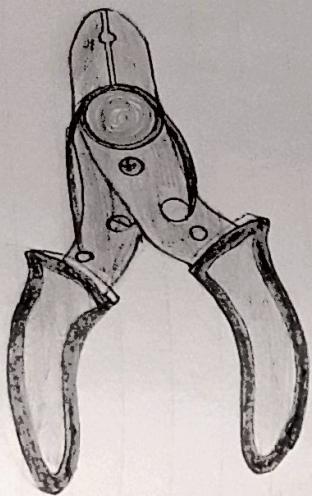
3.1.3 Screwdrivers :-

Screwdrivers can be used to loosen or tighten screws with slotted heads; screwdrivers are available in various size and shape.

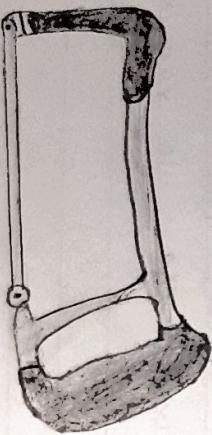




Line tester



Wire stripper

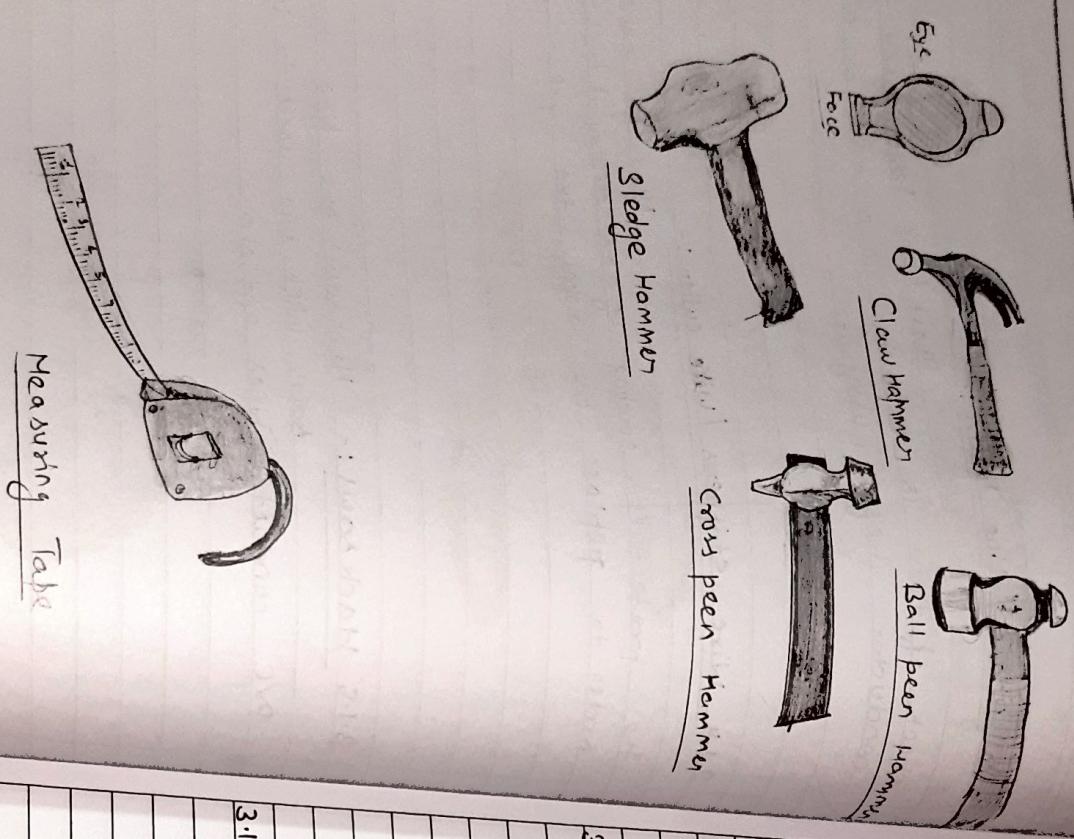


Hacksaw

3.1.4 Wire strippers / wire cutter :-
Phase / Line Tester used to check if there is electricity in a wire or in a conductor before using it.

Used for removing the protective coating of an electrical wire in order to replace or repair the wire.

3.1.5 Hacksaw :- Hacksaws are fine-toothed saws which are used to cut the PVC conduit pipes and etc.

**Q.6 Hammers:-**

Hammers are tools which are used for pounding and pulling out of nails, there are soft and head-faced hammers.

Q.7 Multi-meter:-

A multimeter can be used to measure voltage, current, resistance and capacitance, conductance, a frequency so this instrument could measure almost all things which is needed for an electrician.

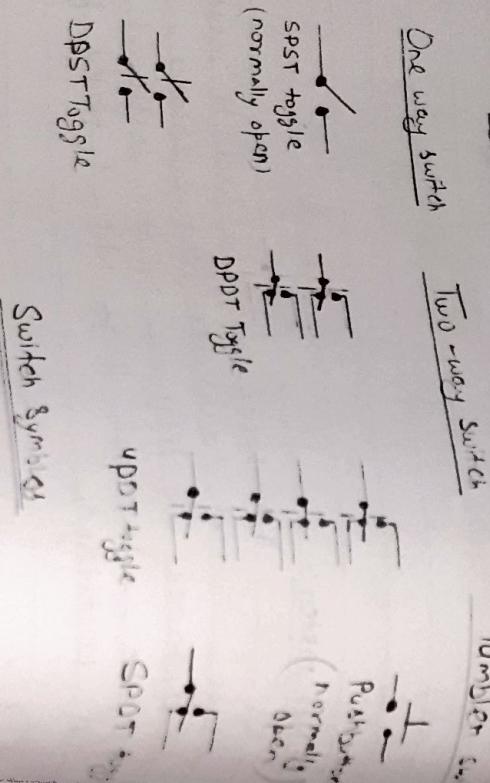
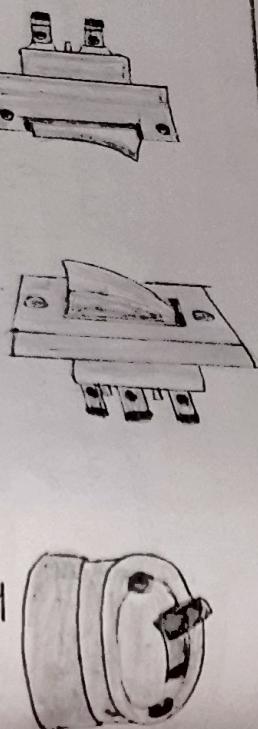
3.1.8 Measuring - Tape:-

A standard tape measure is used for all kinds of field measurement, such as setting heights for switches and outlet, containing lighting fixture boxes, and marking surface for cutouts.

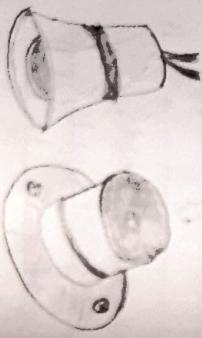
3.2 Blowing Accessories:

3.2.1 Switch:-

A switch is used to make or break an electrical circuit. It is used to switch 'on' or 'off' the supply of electricity to an appliance.



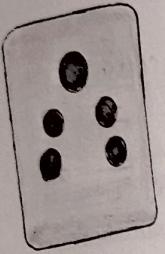
Pendant holder



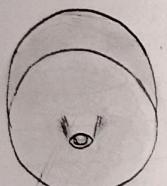
Batten holder

3.2.2 Holders:-

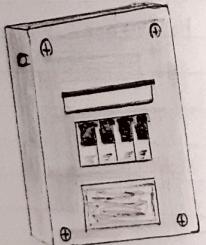
Holders are used to hold lamps.



5 Pin Socket



Ceiling rose



Distribution Box

Expt. No. _____

Date _____

Page No. 93.

3.2.3 Socket Outlet :-

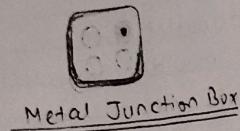
The socket outlet has an insulated base with the moulded or socket base having three terminal sleeves.

3.2.4 Ceiling rose :-

It is used to provide a tapping to the pendant lamp - holder through the flexible wire or a connection to a fluorescent tube.

3.2.5 Miniature Circuit Breaker (MCB):-

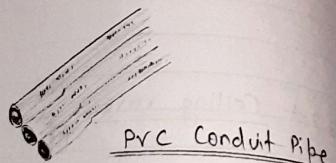
A MCB is used in new constructions instead of the older types of fuses. Circuit breakers are small devices used to control and protect the electrical panel and the other devices from overflowing of electrical power and short circuit.



Metal Junction Box



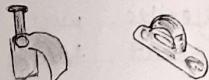
PVC Junction Box



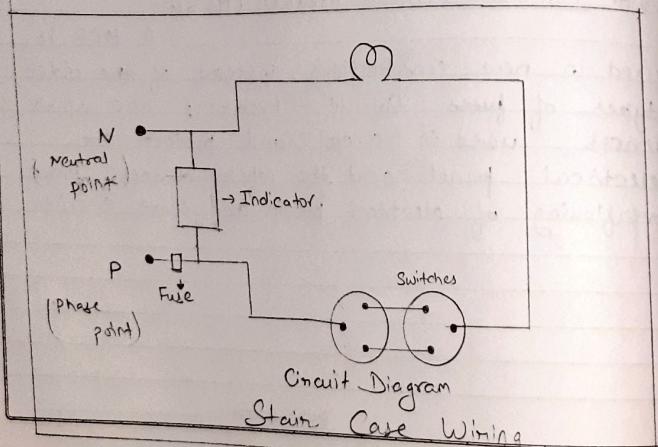
PVC Conduit Pipe



Casing Capping



Conduit Saddle

3.2.6 Junction Box :-

A Junction Box is an electrical enclosure that houses one or more wiring connections.

3.2.7 Electrical Conduit:-

Conduit gives the wire a proper passage and protects it from damage from the outside environment for a long time.

3.2.8 PVC Cable:-

Used to transmit current from one end to another end.

• Study and perform stain Case House wiring:-

Stain case wiring is a type of House wiring which are generally used where one appliance operated with two switches.

APPARATUS

1. One lamp holder, (pendant) 5A, 250V
2. One lamp 40 watts, 250V
3. Two two-way switches, 5A, 250V

4. Connecting wires
5. Insulated plier
6. Electricians knife
7. Screwdrivers.

* Procedure -

1. Connect the lamp with the two switches S_1 & S_2 .
2. Put the lamp in position in the holder.
3. Make the positions I and I' on S_1 and 2, 2' on S_2 .
4. Operate switch S_1 in position 1 and 1'
5. For each position of S_1 put switch S_2 in position 2 and 2' Respectively
6. Observe the result.

* Result :- We have successful studied about tools and accessories used in house wiring & perform stair case wiring.

Very Questions

1. MCCB stands for?

Ans Moulded case circuit Breaker.

2. NCB stands for?

Ans Miniature circuit Breaker.

3. RCCB stands for?

Ans Residual current circuit Breaker.

4. Which type of switch is used in stair case wiring?

Ans Single pole two way switch.

5. In which connection appliances are connected?

Ans Parallel connection.

Aim :- Study and perform single room house wiring.

Required Apparatus:-

S.No.	Material Required	Quantity
1.	Energy Meter 1-Phase	1
2.	SP MCB (Single Pole/Isolator) 16A / 40A	2/1
3.	3 Pin Socket 900 W - 6A	2
4.	Lamp Holder NA	2
5.	SP Switch (Single pole) 6A	3
6.	Fan Regulator 6A	1
7.	PVC Pipes / Capping NA	As per requirement
8.	PVC Insulated wires 1.5S	As per requirement
9.	Screws and saddle NA	As per requirement
10.	Voltmeter NA	1
11.	Ameter NA	1

Required tools:-

S.No.	Tools	S.No.	Tools
1.	Screw driver tool kit	6.	Wire stripper
2.	long Screw Driver	7.	Co nation
3.	Electric drill machine	8.	line tester
4.	Hawl	9.	Test Lamp
5.	Hack saw	10.	Poker

Point to Be focused:-

- Height of switch board should be 4 ft from the floor.
- Always put switch board at left hand side of the door.
- Height of ceiling for should be in the range 8ft to 10 ft from the floor.
- Always use separate MCBs for the Power socket circuits.
- Thickness of Phase and neutral wires should be same.
- Always turn off the main supply while doing any connection or repairing in the wiring system.
- Always use water proof / weather proof Accessories like switches, sockets, lamp, Holders etc

Safety precautions:-

- All tools should be ISI marked.
- Never use damaged or defective tool.
- Always use insulated surface like wooden table, Rubber mat while working on the live system.
- Always wear a good quality Rubber foot wear while working on electrical system.
- Please check all the electric connections are proper and highly connected.

Result:- We have successfully performed single room house wiring.

Viva Questions

1. What is the function of MCB?

Ans It controls the current flow more than rated current and also protect the circuit during short circuit overloading faults.

2. What is the full form of 'ISI'?

Ans Indian Standard Institution.

3. Use Of earthing?

Ans Used to the protect from electric shock.

4. Importance of Ring?

Ans It saves the cost and also protect the system from faulty condition.

5. What is full form of BIS?

Ans Bureau of Indian Standard.