

SRM VALLIAMMAI ENGINEERING COLLEGE

(Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING



I SEMESTER

GE3134 ENGINEERING PRACTICES LABORATORY GROUP B

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Common to All Branches

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GROUP B (ELECTRICAL & ELECTRONICS)

LIST OF EXPERIMENTS

1. Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket.
2. Light and Fan Wiring.
3. Staircase Wiring.
4. Measurement of Voltage, Current, Power and Power factor in electrical circuit.
5. Measurement of Energy using Analog & Digital Energy meter.
6. Measurement of Earth Resistance.
7. Study of Industrial house wiring.
8. Identification & Study of protective devices: Fuses & Fuse carriers, MCB, ELCB and Isolators with ratings and usage.

Additional Experiments

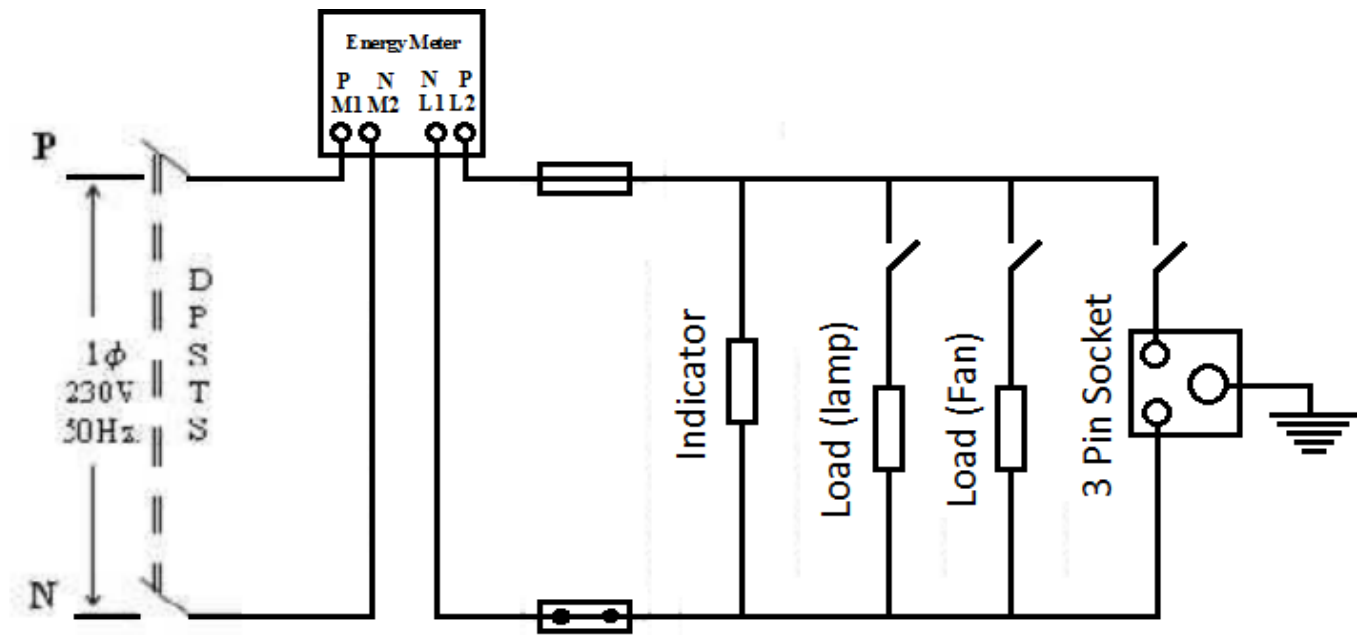
9. Study of Open and Closed Electrical Circuits Using a Switch.
10. Construction and Study of a Simple Electromagnet.

GROUP B (ELECTRICAL & ELECTRONICS)

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S.No	Date	Name of the Experiment	Page No.	Marks (10)	Faculty Signature
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2		Light and Fan Wiring.			
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6		Measurement of Earth Resistance.			
7		Study of Industrial house wiring.			
8		Identification & Study of protective devices: Fuses & Fuse carriers, MCB, ELCB and Isolators with ratings and usage.			
9		Study of Open and Closed Electrical Circuits Using a Switch			
10		Construction and Study of a Simple Electromagnet			

Circuit diagram



Name Plate Details:

Load:

Indicator	$P_1 =$	W	$V = 230V;$	$I_1 =$	Switch: Nil
Lamp	$P_2 =$	W	$V = 230V;$	$I_2 =$	Switch:
Fan	$P_3 =$	W	$V = 230V;$	$I_3 =$	Switch:
3 Pin Socket	$P_4 =$	W	$V = 230V;$	$I_4 =$	Switch:
Full Load	$P =$	W		$I =$	

Fuse Rating Calculation:

125% of the Full Load Current (I) = $(125/100) * I = \underline{\hspace{2cm}}$ Amp

Exp. No.: 1

Date :

Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket.

Aim :

To construct basic switch board wiring using switches, fuse, indicator, lamp, fan and three pin socket and understand the role of each component.

Apparatus Required:

S.No	Apparatus Name	Range / Type	Quantity
1	SPST Switch (Single Pole Single Through)	5A, 230 V	3
2	Fuse	5A	1
3	Indicator	230V	1
4	Lamp	60W, 230V	1
5	Fan	60W, 230V	1
6	Three-Pin Socket	5A, 230 V	1
7	Energy meter	230 V, 50 Hz, 5–20 A, 1200 rev/kWh	1
8	Connecting wires	Single-Strand (Solid) Copper Wire	As required

Theory:

Residential wiring components like switches, fuses, and indicators are essential for safety and control. Conductors (copper or aluminum) are used to carry current. A fuse protects the circuit from overcurrent by melting. An indicator shows the presence of power. A switch is used to make or break the circuit. Wiring should be designed for the expected load and should be neat, typically passing through conduits.

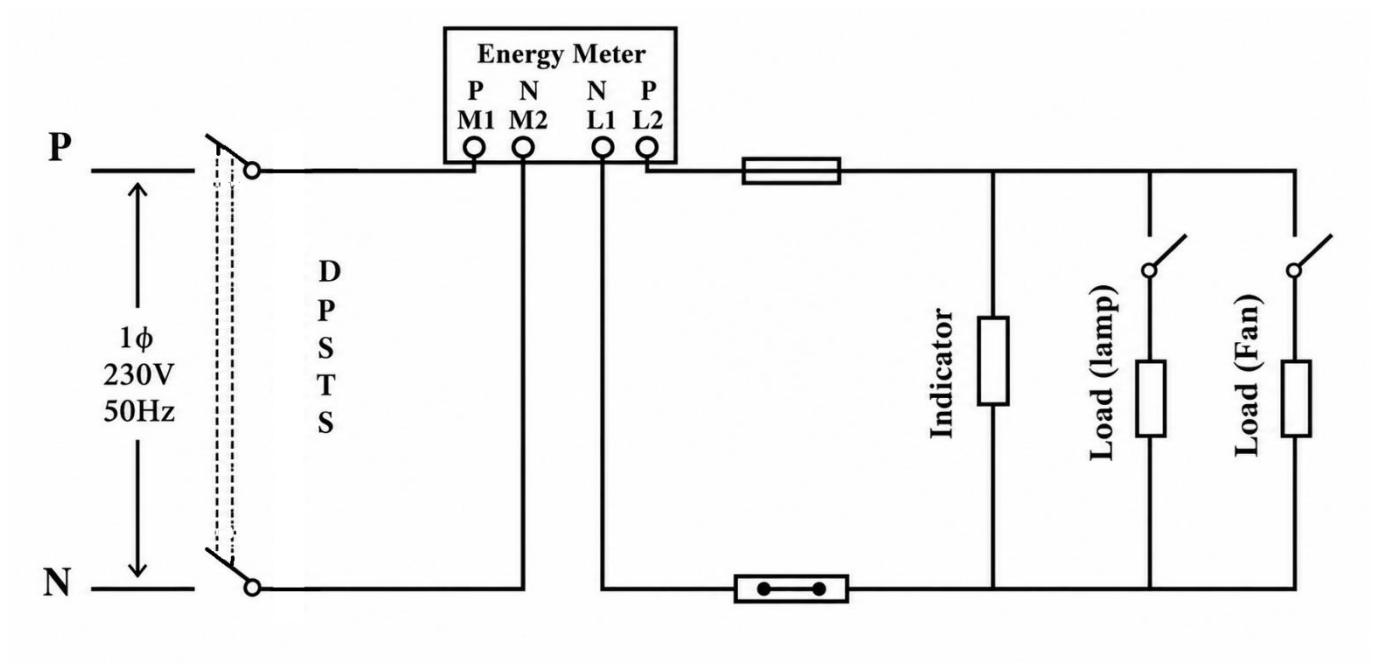
Procedure:

1. Study the given wiring diagram.
2. Mark the positions for the fuse, indicator, switches, lamp, fan, and socket on the board.
3. Fix the components (lamp holder, switches, socket) in the marked positions.
4. Connect the phase wire to the fuse, then to the indicator and switches.
5. Connect the switches to the respective loads (lamp, fan, socket).
6. Connect all neutral points together and connect them to the neutral supply line.
7. Verify the connections and switch on the power supply.
8. Test the working of each component.

Result:

The basic switch board wiring was constructed and tested successfully.

Circuit diagram



Name Plate Details:

Load :

Indicator	$P_1 =$	W	$V = 230V;$	$I_1 =$	Switch: Nil
Lamp	$P_2 =$	W	$V = 230V;$	$I_2 =$	Switch:
Fan	$P_3 =$	W	$V = 230V;$	$I_3 =$	Switch:
Full Load	$P =$	W		$I =$	

Fuse Rating Calculation:

125% of the Full Load Current (I) = $(125/100) * I =$ _____ Amp

Exp. No.: 2

Date:

Light and Fan Wiring.

Aim:

To design and implement light and fan wiring in a residential setting.

Apparatus Required:

S.No	Apparatus Name	Range / Type	Quantity
1	SPST Switch (Single Pole Single Through)	5A, 230 V	3
2	Fuse	5A	1
3	Indicator	230V	1
4	Lamp	60W, 230V	1
5	Fan	60W, 230V	1
6	Energy meter	230 V, 50 Hz, 5–20 A, 1200 rev/kWh	1
7	Connecting wires	Single-Strand (Solid) Copper Wire	As required

Theory:

Light and fan wiring is commonly used in residential buildings. Separate switches are provided to control the lamp and fan independently. The fan regulator controls the fan speed by varying the supplied voltage. The phase wire is connected through the switches to the lamp and fan, while the neutral wire provides the return path. Proper wiring ensures safe and efficient operation of both appliances.

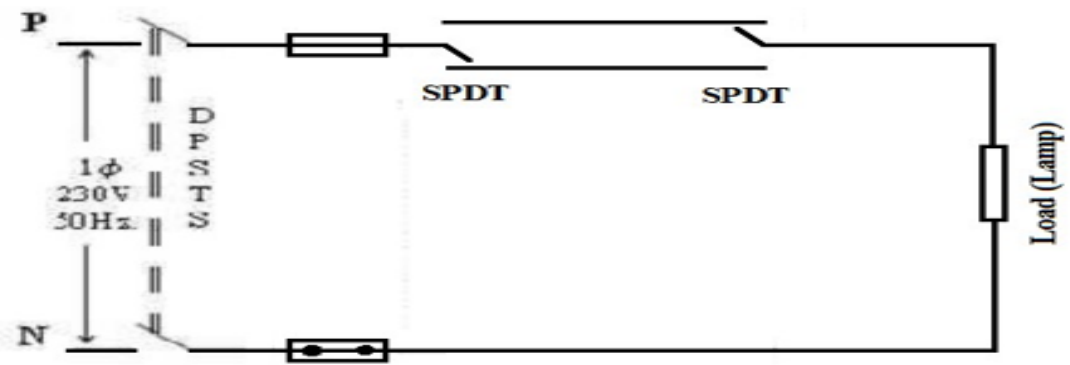
Procedure:

1. Study the wiring diagram carefully.
2. Fix the lamp holder, ceiling fan, switches, and fan regulator on the wiring board.
3. Connect the phase (live) wire to the input of both switches.
4. Connect one switch directly to the incandescent lamp.
5. Connect the other switch to the fan regulator, and then connect the regulator to the fan.
6. Connect the neutral wire to both the lamp and the fan.
7. Check all the wiring connections to make sure they are correct and tight.
8. Switch ON the power supply.
9. Turn ON the lamp switch and check whether the lamp glows.
10. Turn ON the fan switch and use the regulator to check whether the fan speed changes.
11. Record your observations.

Result:

The light and fan wiring was implemented and verified.

Circuit diagram



Name Plate Details:

Load:

Lamp P= W V=230V; I= Switch:

Full Load P= W I=

Fuse Rating Calculation:

125% of the Full Load Current (I) = $(125/100) * I = \underline{\hspace{2cm}}$ Amp

Observation Table:

S.No	Switch S1	Switch S2	Lamp Status (Glowing / Not Glowing)
1	ON	ON	
2	ON	OFF	
3	OFF	ON	
4	OFF	OFF	

Exp. No.: 3

Date:

Staircase Wiring.

Aim:

To control a single lamp from two different locations using two-way switches.

Apparatus Required:

S.No	Apparatus Name	Range / Type	Quantity
1	SPDT Switch (Single Pole Double Throw)	5A, 230 V	3
2	Lamp	60W, 230V	1
3	Connecting wires	Single-Strand (Solid) Copper Wire	As required

Theory:

Staircase wiring is used to control one lamp from two different locations. It is commonly installed in staircases, corridors, and hallways, where lights need to be operated from either end. The circuit uses two SPDT (Single Pole Double Throw) switches connected with two traveler wires. Changing the position of either switch completes or breaks the circuit, turning the lamp ON or OFF. This wiring provides convenience, improves safety, and helps save electrical energy by allowing easy control of the lamp.

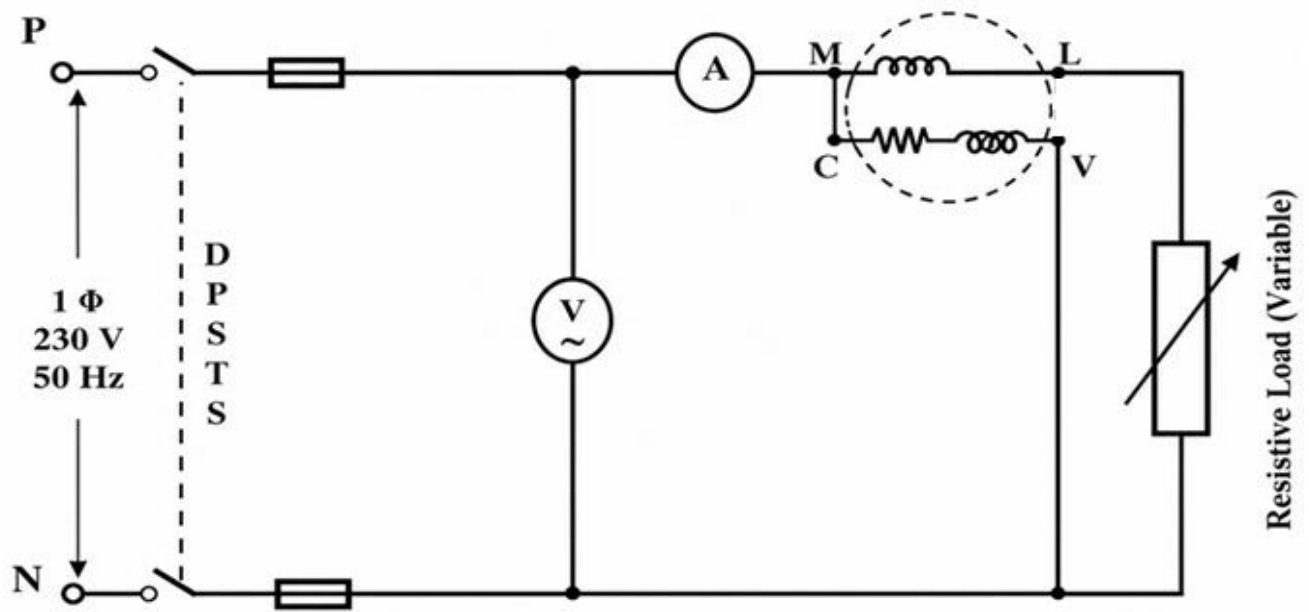
Procedure:

1. Study the staircase wiring diagram carefully.
2. Fix the two SPDT (two-way) switches and the lamp holder on the wiring board.
3. Connect the phase (live) wire to the common terminal of the first SPDT switch.
4. Connect the two output terminals of the first switch to the corresponding terminals of the second switch using connecting wires.
5. Connect the common terminal of the second SPDT switch to one terminal of the lamp holder.
6. Connect the other terminal of the lamp holder to the neutral wire.
7. Check all the wiring connections and make sure they are correct and tight.
8. Switch ON the power supply.
9. Operate either switch and observe the lamp.
10. Verify that the lamp can be turned ON or OFF from both switch locations.
11. Record your observations.

Result:

The staircase wiring was successfully constructed and tested.

Circuit diagram



Name Plate Details:

Load:

Resistive Load $P_2 =$ W $V = 230V$; $I_2 =$

Full Load $P =$ W $I =$

Fuse Rating Calculation:

125% of the Full Load Current (I) = $(125/100) * I =$ _____ Amp

Exp. No.: 4

Date:

Measurement of Voltage, Current, Power and Power factor in electrical circuit.

Aim:

To measure voltage, current, power and power factor in a single phase AC circuit using a resistive load.

Apparatus Required:

S.No	Apparatus Name	Range / Type	Quantity
1	AC Voltmeter	0–300 V	1
2	AC Ammeter	0–5 A	1
3	Single Phase Wattmeter	300 V, 5 A (LPF/UPF type)	1
4	Resistive Load (R Load / Rheostat or Lamp Load Bank)	0–1 kW, 230 V (or variable 0–5 A load)	1
5	Single Phase AC Supply	230 V, 50 Hz	1
6	Connecting Wires	Single-Strand (Solid) Copper Wire	As required

Theory:

In a single-phase AC circuit, electrical quantities such as voltage, current, power, and power factor can be measured using suitable measuring instruments. The voltmeter measures the supply voltage, the ammeter measures the current flowing through the load, and the wattmeter measures the real (active) power consumed by the load. For a purely resistive load, the voltage and current are in phase with each other. Hence, the phase angle (ϕ) is 0° , and the power factor is unity (1.0). The real power consumed by the circuit is given by: $P = V \times I \times \cos\phi$

where:

P = Real Power (W)

V = Supply Voltage (V)

I = Load Current (A)

Procedure:

1. Make the connections as shown in the circuit diagram.
2. Keep the resistive load at the minimum (no-load) position.
3. Switch on the single-phase AC power supply.
4. Increase the load gradually by adjusting the resistive load.
5. Measure and record the readings of the voltmeter, ammeter, and wattmeter.
6. Repeat the experiment for different load settings.
7. After taking all the readings, reduce the load slowly to the minimum position.
8. Switch off the power supply.

Observation table:

Sl.No	Actual Load (W)	Voltage (V)	Current (A)	Power (W) Multiplication Factor=		Apparent Power (VA)	Power Factor (Cos ϕ)
				Observed	Actual		
1							
2							
3							
4							
5							

Formula used:

Real Power = $V \times I \times \cos\phi$ (in Watts)

Actual Power = Observed Wattmeter reading $\times$ Multiplication Factor

Apparent Power = $V \times I$ (in Watts)

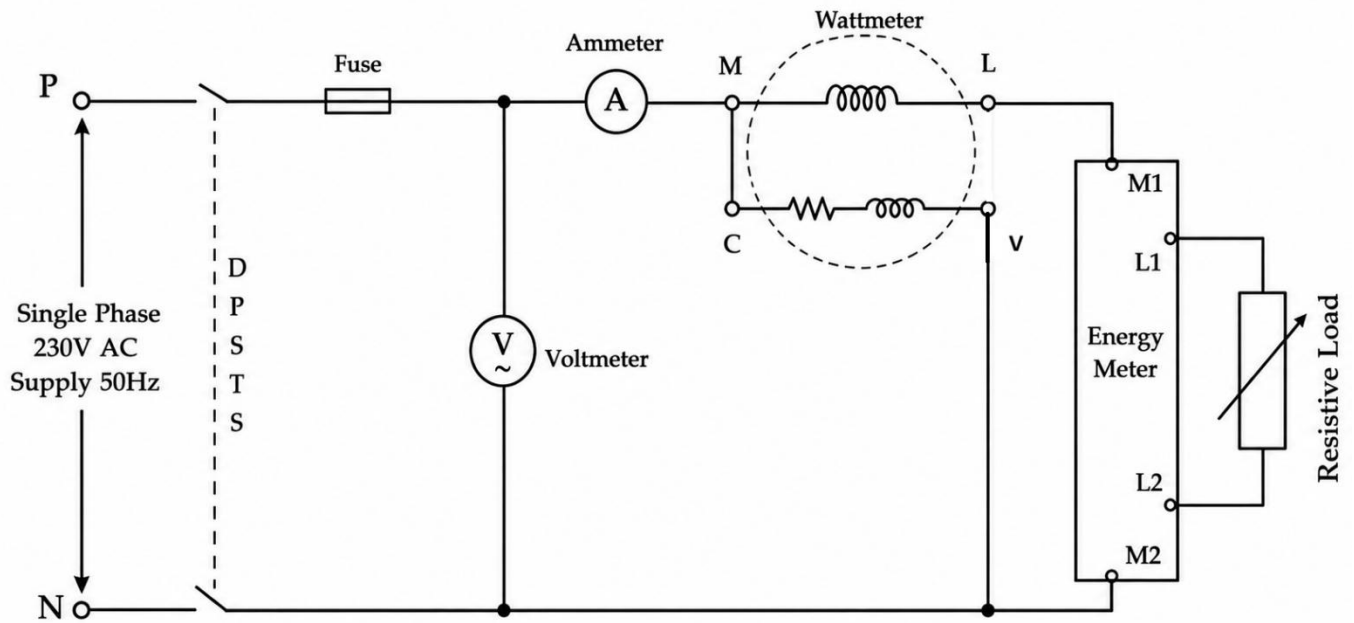
Power Factor (Cos ϕ) = Actual Power / Apparent Power

Model Calculation:

Result:

Thus, the voltage, current, power, and power factor of a single-phase AC circuit using a resistive load were measured successfully, and the power factor was found to be approximately 1 (unity).

Circuit diagram



Name Plate Details:

Load:

Resistive Load P= W V=230V; I=

Full Load P= W I=

Fuse Rating Calculation:

125% of the Full Load Current (I) = $(125/100) * I$ = _____ Amp

Exp. No.: 5

Date:

Measurement of Energy using Analog & Digital Energy meter

Aim:

To measure the electrical energy consumed in a single-phase AC circuit using analog and digital energy meters.

Apparatus Required:

S.No	Apparatus Name	Range / Type	Quantity
1	Single Phase Analog Energy Meter	230 V, 5–20 A, 50 Hz	1
2	Single Phase Digital Energy Meter	230 V, 5–20 A, 50 Hz	1
3	AC Voltmeter	0–300 V	1
4	AC Ammeter	0–5 A	1
5	Single Phase Wattmeter	300 V, 5 A	1
6	Variable Resistive Load	230 V, 0–1 kW	1
7	Connecting Wires	Single-Strand (Solid) Copper Wire	As required

Theory:

An energy meter measures the electrical energy consumed by a load over a period of time. The unit of electrical energy is kilowatt-hour (kWh).

An analog (induction type) energy meter works on the principle of electromagnetic induction. It consists of a current coil connected in series with the load and a voltage coil connected across the supply. The interaction of the magnetic fields produces a torque that rotates an aluminium disc. The number of disc revolutions is proportional to the energy consumed.

A digital energy meter measures voltage and current electronically using sensors and a microcontroller. It calculates the energy consumed accurately and displays it directly on a digital display in kWh.

Procedure:

1. Make the connections as shown in the circuit diagram.
2. Keep the resistive load at the minimum position.
3. Switch ON the single-phase AC supply.
4. Increase the load gradually by adjusting the resistive load.
5. Note the readings of the voltmeter, ammeter, wattmeter, analog energy meter, and digital energy meter.
6. Record the time taken for a fixed number of revolutions of the analog energy meter disc (e.g., 5 revolutions).

Observation table:

Sl.No	Voltage (V)	Current (A)	Power (W) Multiplication Factor=		Time in Seconds (t) (5 Revs)	Calculated Energy (kWh)	Observed Energy (kWh)- Analog Energy meter	Observed Energy (kWh)- Digital Energy meter	% Error
			Observed	Actual					
1									
2									
3									
4									
5									

Formula used:

1. Calculated Energy

$$\text{Calculated Energy} = (P \times t) / (1000 \times 3600); \text{ kWh}$$

2. Observed Energy

$$\text{Observed Energy} = N / n; \text{ kWh}$$

where,

N = Number of disc revolutions = 5

n = Energy meter constant (rev/kWh) = 1200 rev/kWh

3. Percentage Error

$$\% \text{ Error} = [(\text{Observed Energy} - \text{Calculated Energy}) / \text{Observed Energy}] \times 100$$

Model Calculation:

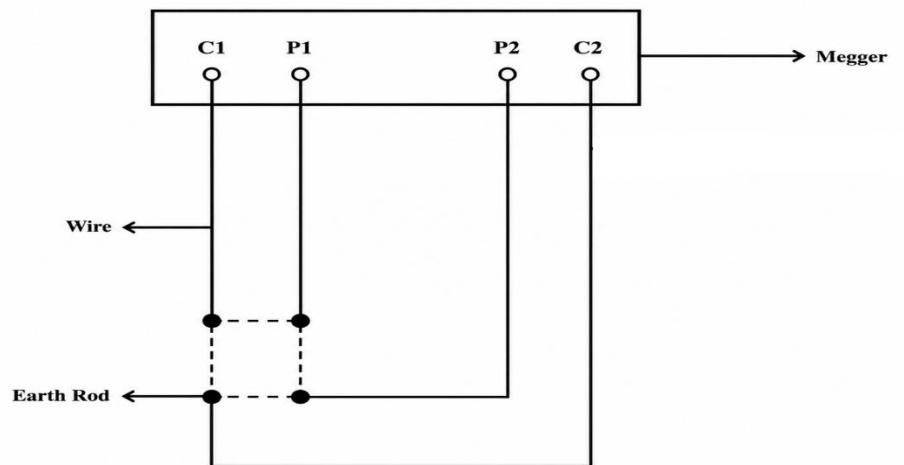
7. Repeat the experiment for different load values.
8. Reduce the load to the minimum position.
9. Switch OFF the power supply.
10. Calculate the percentage error of the analog energy meter using the given formula and compare it with the digital energy meter reading.

Result:

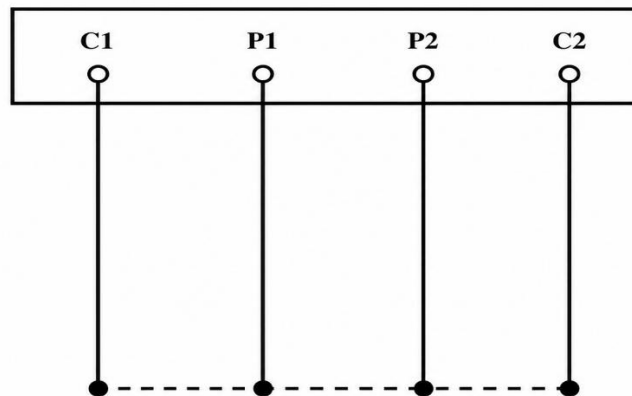
Thus, the energy consumed in the single-phase AC circuit was measured successfully using analog and digital energy meters, and the percentage error was calculated.

Circuit diagram

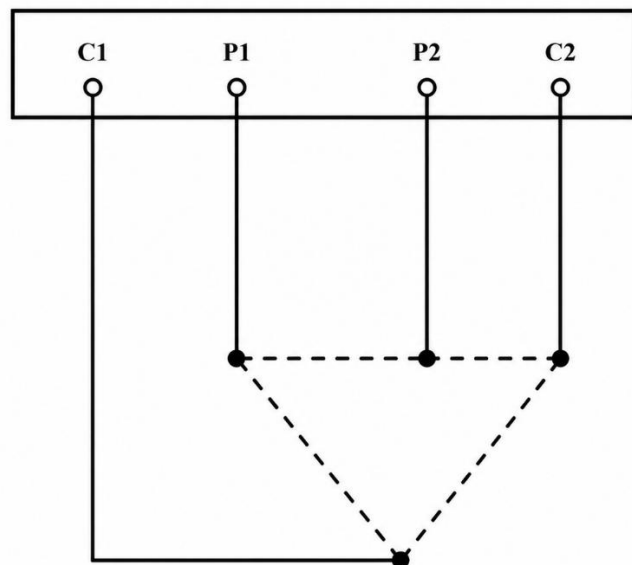
SQUARE POSITION



HORIZONTAL POSITION



TRIANGULAR POSITION



Exp. No.: 6

Date:

Measurement of Earth Resistance.

Aim:

To measure the earth resistance of an electrical equipment using an Earth Resistance Tester (Megger).

Apparatus Required:

S.No	Apparatus Name	Range / Type	Quantity
1	Earth Resistance Tester (Megger)	0–100 Ω	1
2	Earth Rods (Auxiliary Electrodes)	Rod	2
3	Connecting Wires	Single-Strand (Solid) Copper Wire	3
4	Hammer	-	1

Theory;

Earth resistance is the resistance offered by the earth electrode to the flow of electric current into the ground. A low earth resistance ensures the safe operation of electrical installations by providing a low-resistance path for fault currents.

The earth resistance is measured using an Earth Resistance Tester (Earth Megger). The instrument consists of a hand-driven or electronic generator, a current circuit, and a potential measuring circuit. It generally has four terminals:

C1 – Current terminal

P1 – Potential terminal

P2 – Auxiliary potential terminal

C2 – Auxiliary current terminal

Two auxiliary earth rods are driven into the ground at specified distances from the earth electrode under test. A current is passed through the earth between terminals C1 and C2, while the voltage drop between P1 and P2 is measured.

Using Ohm's Law,

$$R = V/I$$

where

R = Earth Resistance (Ω)

V = Voltage between potential terminals

I = Current through current terminals

The instrument automatically calculates and displays the earth resistance directly in ohms.

Observation table:

S.No	Position (Distance in Meter)	Resistance (Ω)
1	Square C1-P1: _____m, C1-P2: _____m, C1-C2: _____m, P1-P2: _____m, P1-C2: _____m, P2-C2: _____m	
2	Horizontal C1-P1: _____m, C1-P2: _____m, C1-C2: _____m, P1-P2: _____m, P1-C2: _____m, P2-C2: _____m	
3	Triangular C1-P1: _____m, C1-P2: _____m, C1-C2: _____m, P1-P2: _____m, P1-C2: _____m, P2-C2: _____m	

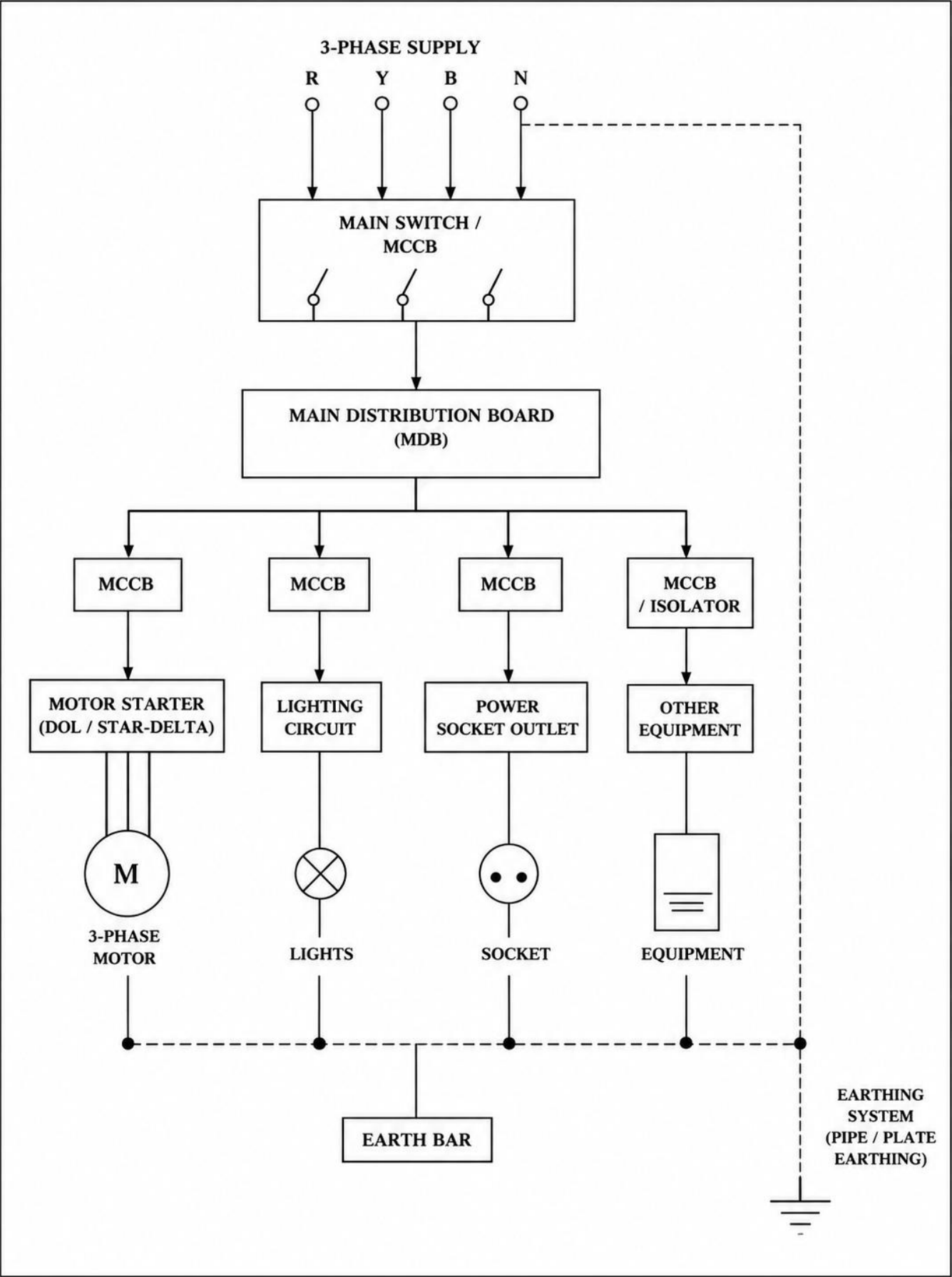
Procedure:

1. Select a suitable location for testing.
2. Drive two auxiliary earth rods into the ground in line with the earth electrode under test.
3. Connect the terminals as per the circuit diagram.
4. Ensure all connections are tight.
5. Rotate the Megger handle (or switch ON the digital tester).
6. Observe the earth resistance reading.
7. Repeat the measurement for Horizontal, Square, and Triangular positions.
8. Record the readings and calculate the average earth resistance.

Result:

The earth resistance of the given electrical equipment was measured successfully using an Earth Resistance Tester (Megger).

Industrial Wiring Layout:



Exp. No.: 7

Date:

Study of Industrial house wiring

Aim:

To study the characteristics and differences between residential and industrial electrical wiring.

Theory:

Residential wiring is typically single-phase and uses PVC insulated cables. It focuses on convenience and safety for home appliances. Industrial wiring, however, is based on 3-phase electrical power to support heavy machinery and motors, providing higher efficiency and power capacity. Industrial installations use metal conduits, armored cables, or raceways for mechanical protection and grounding. Key components in industrial wiring include busbars, large-scale distribution boards, and industrial-grade isolators.

Comparison Table:

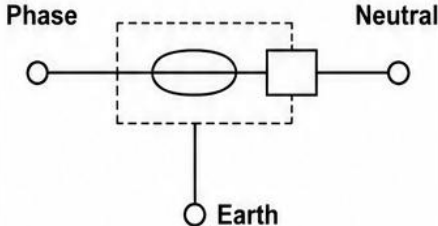
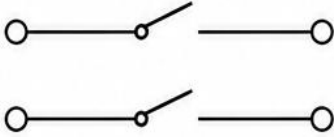
Feature	Residential Wiring	Industrial Wiring
Power Supply	Single Phase (230 V)	Three Phase (415 V or higher)
Load	Lights, Fans, Home Appliances	Motors, Machines, Industrial Equipment
Wiring System	PVC Insulated Wires	Armored Cables / Metal Conduits
Protection	MCB, RCCB/ELCB, Fuses	MCCB, HRC Fuses, Isolators, Relays
Installation	Simple	Complex
Current Rating	Low	High
Earthing	Pipe or Plate Earthing	Multiple Earthing for Equipment and Panels

Result:

The study of industrial house wiring was completed, and the differences from residential wiring were noted.

ELECTRICAL PROTECTIVE DEVICES

DEVICES AND THEIR SYMBOLS

Sl. No.	DEVICE	PHOTOGRAPH	SYMBOL
1.	FUSE (Kit-Kat Type)		SYMBOL  Fuse Symbol
2.	MCB (Miniature Circuit Breaker)		SYMBOL  MCB Symbol
3.	ELCB (Earth Leakage Circuit Breaker)		SYMBOL  Voltage Base ELCB Symbol
4.	ISOLATOR (DP Isolator)		SYMBOL  DP Isolator Symbol

Note: Symbols are as per common practice in electrical drawings.

Exp. No.: 8

Date:

Identification & Study of protective devices: Fuses & Fuse carriers, MCB, ELCB and Isolators with ratings and usage.

Aim:

To identify and study various electrical protective devices and understand their ratings and applications.

Theory:

Protective devices are essential to prevent damage from short circuits, overloads, and earth faults. They safeguard both the equipment and the user from electric shocks.

1. Fuse:

A safety device that melts and breaks the circuit during overcurrent. Types include Kit-Kat fuses, Cartridge fuses, and HRC (High Rupture Capacity) fuses.

2. MCB (Miniature Circuit Breaker):

An automatic switch that trips during overload or short circuit. It can be reset manually. Rated typically from 6A to 40A.

3. ELCB (Earth Leakage Circuit Breaker):

Detects small leakage currents to the earth and trips the circuit to prevent electric shock to the user.

4. Isolator:

A manually operated switch used to isolate a part of the circuit for safe maintenance. It does not provide automatic protection but ensures visual confirmation of disconnection.

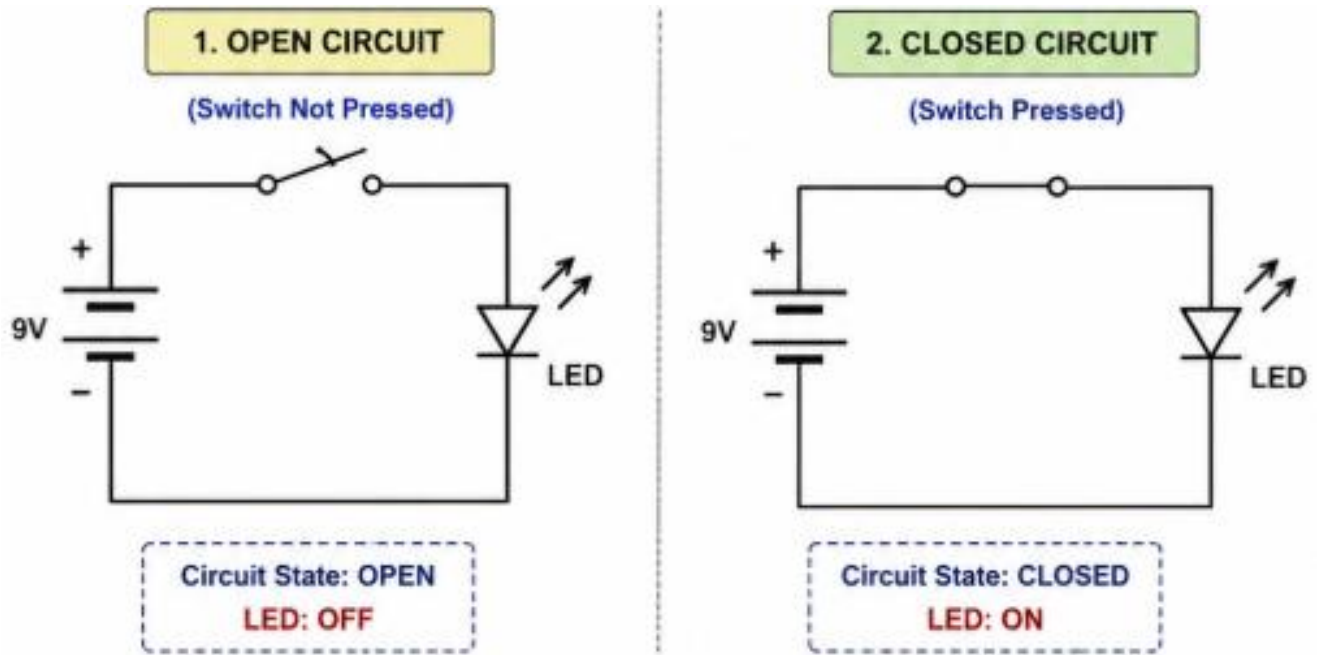
Comparison Table:

Device	Operating Principle	Main Purpose	Reset Method
Fuse	Thermal (Melting)	Overcurrent/Short Circuit	Replace Wire
MCB	Thermo-Magnetic	Overload/Short Circuit	Manual Toggle
ELCB	Current Imbalance	Leakage Protection	Manual Toggle

Result:

Various protective devices were identified, and their functions and ratings were studied.

Circuit Diagrams:



Observation Table:

Switch Position	Circuit State	Observation (LED On/Off)
Not Pressed	Open	
Pressed	Closed	

Exp. No.: 9

Date:

Study of Open and Closed Electrical Circuits Using a Switch

Aim:

To construct a simple circuit and understand how a switch controls the flow of electricity.

Apparatus Required:

S.No	Item	Quantity
1	LED/Bulb	1
2	9V Battery	1
3	Simple Push-Button Switch	1
4	Connecting Wires	As required

Theory:

A Closed Circuit is a complete loop that allows current to flow, turning on the device. An Open Circuit is a broken loop where current cannot flow. A switch is a device used to intentionally open or close the circuit.

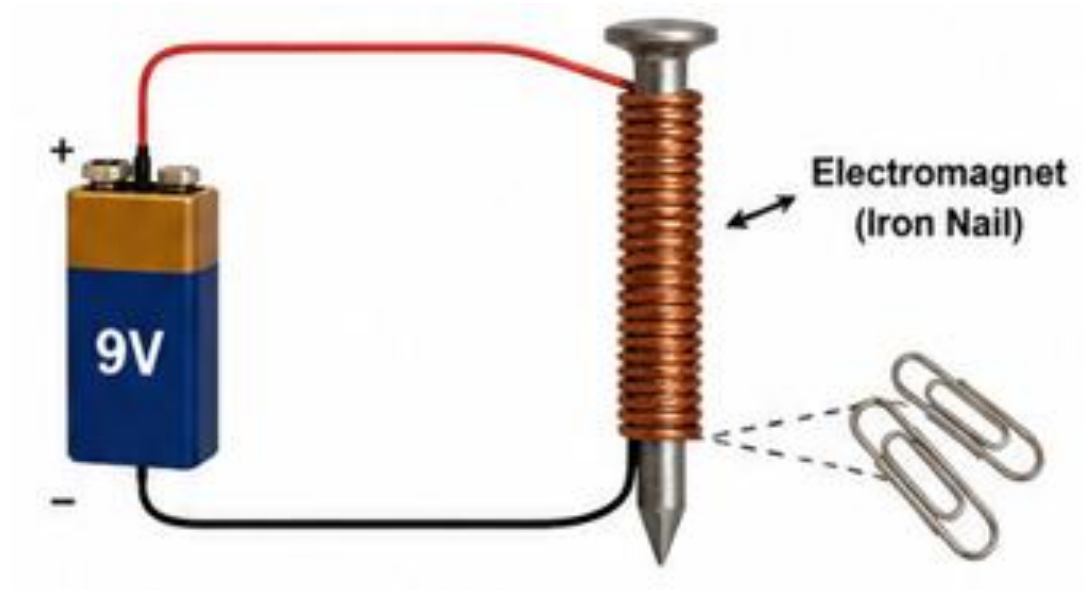
Procedure:

1. Connect the positive terminal of the battery to one end of the switch.
2. Connect the other end of the switch to the LED.
3. Connect the LED back to the negative terminal of the battery.
4. Observe the LED when the switch is NOT pressed (Open Circuit).
5. Observe the LED when the switch IS pressed (Closed Circuit).
6. Note the difference in state.

Result:

The function of a switch in opening and closing a circuit was demonstrated.

Circuit Diagram:



Observation Table:

Condition	Attracts Clips? (Yes/No)
Battery Connected	
Battery Disconnected	

Exp. No.: 10

Date:

Construction and Study of a Simple Electromagnet

Aim:

To study the relationship between electricity and magnetism by creating a simple electromagnet.

Apparatus Required:

S.No	Item	Quantity
1	Large Iron Nail	1
2	Insulated Copper Wire	1 meter
3	9V Battery	1
4	Small Paper Clips / Iron Pins	Set

Theory:

When an electric current flows through a wire, it creates a magnetic field around the wire. By winding the wire into a coil (solenoid) around a ferromagnetic core (like an iron nail), the magnetic field is concentrated, turning the nail into a temporary magnet known as an electromagnet.

Procedure:

1. Tightly wrap the insulated copper wire around the iron nail multiple times (around 30-50 turns).
2. Strip the insulation from both ends of the wire.
3. Connect the ends of the wire to the positive and negative terminals of the battery.
4. Bring the tip of the nail close to the paper clips and observe if they are attracted.
5. Disconnect one end of the wire from the battery and observe if the paper clips fall off.
6. Repeat the process with more turns of wire and see if the magnetic strength increases.

Result:

An electromagnet was successfully created, demonstrating that electricity can produce magnetism.

Available Ratings of Electrical Laboratory Apparatus in Open Market

Switch

Switch 1: 5 A, 230 V
 Switch 2: 10 A, 230 V
 Switch 3: 16 A, 230 V
 Switch 4: 20 A, 230 V
 Switch 5: 32 A, 230 V

Lamp

Lamp 1: 15 W, 230 V
 Lamp 2: 23 W, 230 V
 Lamp 3: 28 W, 230 V
 Lamp 4: 40 W, 230 V
 Lamp 5: 60 W, 230 V
 Lamp 6: 100 W, 230 V
 Lamp 7: 200 W, 230 V

Fan

Fan 1: 24 W, 230 V
 Fan 2: 35 W, 230 V
 Fan 3: 60 W, 230 V

Indicator

Indicator 1: 230 V AC, 1 mA (Neon)
 Indicator 2: 230 V AC, 5 mA (LED Red)
 Indicator 3: 230 V AC, 5 mA (LED Green)
 Indicator 4: 230 V AC, 5 mA (LED Yellow)

3-Pin Socket

3-Pin Socket 1: 5 A, 230 V
 3-Pin Socket 2: 16 A, 230 V
 3-Pin Socket 3: 32 A, 230 V

Energy Meter

Energy Meter 1: 5 A, 230 V, 1200 rev/kWh
 Energy Meter 2: 10 A, 230 V, 1200 rev/kWh
 Energy Meter 3: 20 A, 230 V, 1200 rev/kWh

Resistive Load

Resistive Load 1: 1 kW, 230 V
 Resistive Load 2: 2 kW, 230 V
 Resistive Load 3: 5 kW, 230 V
 Resistive Load 4: 10 kW, 230 V

Inductive Load

Inductive Load 1: 1 kW, 230 V
 Inductive Load 2: 2 kW, 230 V
 Inductive Load 3: 5 kW, 230 V
 Inductive Load 4: 10 kW, 230 V

Wattmeter

Wattmeter 1: 300 V, 5 A, UPF
 Wattmeter 2: 300 V, 5 A, LPF
 Wattmeter 3: 300 V, 10 A, UPF
 Wattmeter 4: 300 V, 10 A, LPF

Voltmeter

Voltmeter 1: 0–1 V
 Voltmeter 2: 0–10 V
 Voltmeter 3: 0–20 V
 Voltmeter 4: 0–150 V
 Voltmeter 5: 0–300 V
 Voltmeter 6: 0–600 V

Ammeter

Ammeter 1: 0–1 A
 Ammeter 2: 0–5 A
 Ammeter 3: 0–10 A
 Ammeter 4: 0–15 A
 Ammeter 5: 0–20 A
 Ammeter 6: 0–25 A

Wire

Wire 1: 0.5 mm² PVC Copper (≈5 A)
 Wire 2: 1.0 mm² PVC Copper (≈10 A)
 Wire 3: 1.5 mm² PVC Copper (≈16 A)
 Wire 4: 4 mm² PVC Copper (≈32 A)

Autotransformer

Autotransformer 1: 1 Phase, 0–300 V, 1 kVA
 Autotransformer 2: 1 Phase, 0–300 V, 5 kVA

Fuse

Fuse 1: 1 A
 Fuse 2: 2 A
 Fuse 3: 5 A
 Fuse 4: 10 A
 Fuse 5: 15 A
 Fuse 6: 20 A
 Fuse 7: 25 A