Basic Electrical Engineering

PRACTICAL

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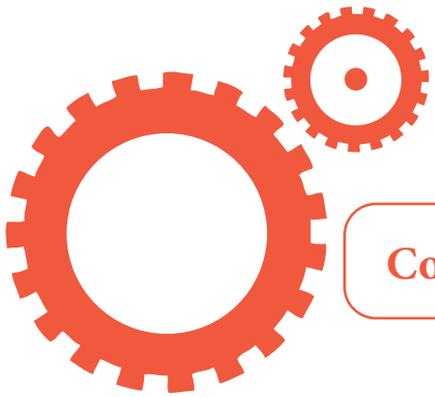

Contents

CLASS XI

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EXPERIMENT

1 Study of hand tools and wiring

Aim:

To study about various hand tools and measuring equipments for wiring.

Tools/equipments to know:

i) Hand tools for wiring:

S.No	Name of the hand tool/ Equipment	Picture of the hand tool/Equipment	Uses
1	Combinational plier		Combinational plier is used for cutting, twisting, pulling, holding and gripping the wires and objects.
2	Long nose plier		Long nose pliers are used for holding small objects in places where fingers cannot reach.
3	Round nose plier		Wire hooks and loops could be made using the round nose plier.

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4	Wire cutter		Wire cutter is used for cutting copper or aluminium wires having small diameter.
5	Screw driver		Screw driver is used for tightening or loosening screws.
6	Electrician knife		Electrician knife is used for removing the insulation of cables and cleaning the wire surface.
7	Line tester		Line tester is used to indicate the supply in a particular equipment.
8	Ball peen hammer		Ball peen hammer is made up of special steel and is used for straightening and bending nails. The handle is made up of hard wood.

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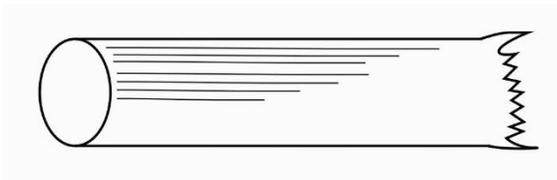
9	Rawl jumper		Rawl jumper is used for making holes in bricks, concrete wall and ceiling.
10	Pipe jumper		Pipe jumper is used with a hammer to make holes in wall which is required for wiring.
11	Mallet		Mallet is used for straightening and bending of thin metallic sheets.
12	Try square		Try square is used to check whether the object is plane, perpendicular or at right angle.
13	Measuring steel tape		Measuring steel tape is used for measuring the dimension of the wiring installation and general measurements.
14	Hacksaw		Hacksaw is used for cutting the wooden objects.

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15	Pincers		Pincers are used for extracting nails from the wood.
16	Firmer chisel		Firmer chisel is used for chipping, scrapping and grooving the woods.
17	Poker		Poker is a long sharp tool used for making pilot holes on wooden articles to fix screws.
18	Spanner		Spanner is used for loosening and tightening of nuts and bolts.
19	Ring spanner		Ring spanner is used in place where the space is restricted.
20	Center punch		Center punch is used for making and punching holes on metals.
21	Hand drilling machine		Hand drilling machine is used for making holes in thin metal sheets or in wooden objects.

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22	Electrical drilling machine		When power is available, electrical drilling machine is convenient and it is an accurate tool for drilling holes on wood and metal objects.
23	Soldering iron		A *soldering iron* is used to solder (connect) pieces of wire with the help of soldering lead.
24	Desoldering iron		It is a manually-operated device which is used to remove unwanted soldered lead from a printed circuit board.

ii) Measuring equipment in electrical circuit:

S.No	Name of the measuring equipments	Picture of the equipment	Uses
1	Ammeter (MI)		Ammeter is used to measure the current in the circuit. MI ammeters are used measure both AC & DC.

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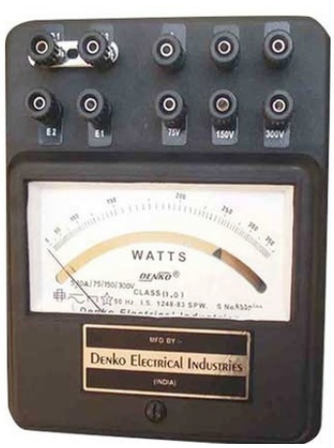
2	Ammeter (MC)		Moving coil type of ammeters are used to measure only DC current.
3	Voltmeter(MI)		Voltmeter is used to measure the potential difference (in volts) in the circuit. MI voltmeter is used to measure AC & DC.
4	Voltmeter (MC)		Moving coil type of voltmeter is used to measure only DC voltage.
5	Wattmeter		Wattmeter is used to measure power in the circuit.

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6	Energy meter (Single phase)		Energy meter is used to measure the consumption of electrical energy by the load.
7	Energy meter (Three phase)		Three phase energy meter is used to measure the electrical energy in three phase circuits.
8	Power factor meter		Power factor meter is used to measure the phase angle between the voltage and current.
9	Multimeter		Multimeter is used to measure the electrical quantities like voltage, current both in AC and DC resistance etc.

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10	Clamp meter		Clamp meter is used to measure the current in the live conductor.
11	Frequency meter		Frequency meter is used to measure the frequency of AC signal in Hertz.
12	Tachometer		Tachometer is used to measure the number of rotation or speed of a motor.
13	Megger		Megger is used to measure the insulation value of a resistance in mega ohms.

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14	Earth tester		Earth tester is used to measure the value of earth resistance in low range.
15	TDS meter		Total dissolved solids (TDS) meters are used to measure the level of solid content in water.

Result:

Thus, the concept of hand tools and safety tools for wiring and measuring equipments were studied and known.

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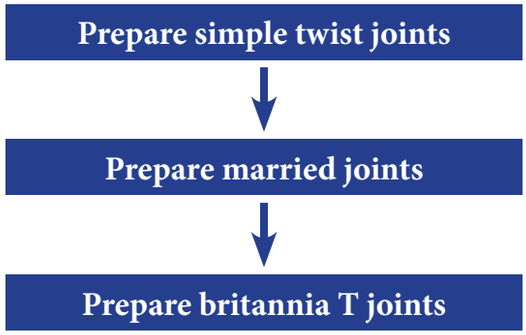
EXPERIMENT

2 Wiring joints

Aim:

To prepare various type of wiring joints.

Practical procedure



Tools and materials required:

S.No	Name of the Tools/Equipment	Range/Value	Quantity
1	Diagonal cutting plier	150 mm	1 No
2	Combination plier	200 mm	1 No
3	Stainless steel rule	300 mm	1 No
4	Wooden mallet	75 mm	1 No
5	Electrician's knife	100 mm	1 No
6	Hand vice	50 mm	1 No
7	PVC insulated copper wire	1/1.12	3 m
8	PVC insulated copper wire	1/1.40	3 m

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9	PVC insulated copper wire	7/20	2 m
10	PVC insulated wire	3/20	2 m
11	GI wire	4 mm 30 cm	2 Nos
12	Copper wire	4 mm 30 cm	2 Nos
13	Hard drawn copper wire	4 mm dia	0.5 m
14	Tinned copper wire	0.91 mm	4 m

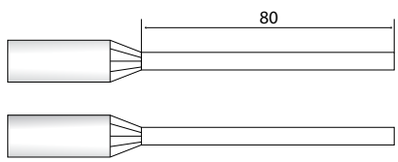
Procedure:

Task 1: Prepare simple twist joints

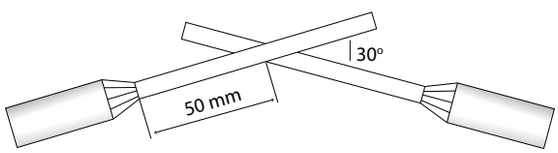
Step 1: Take two pieces of 1/1.12 copper wire of 0.5 meter length.

Step 2: Measure and mark 80mm on, each length of the wire.

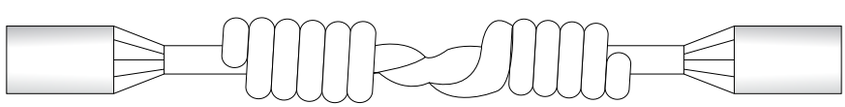
Step 3: Remove PVC insulation from each conductor for a length of 80 mm as shown below.



Step 4: Place the conductor together about 50 mm from the ends with an angle of 30 degree as shown below.



Step 5: Twist the conductor tightly around each other in opposite direction at least six turns each side with the help of pliers as shown below.



Task 2: Prepare married joints

Step 1: Take two pieces of PVC copper wire 7/20 each 0.5 meter in length.

Step 2: Mark the wire about 120 mm from the wire, in both wires.

Step 3: Remove the PVC insulation for 120 mm on both the wires.

Step 4: Re-twist the strands back to its original direction for 70 mm at the ends as shown below.

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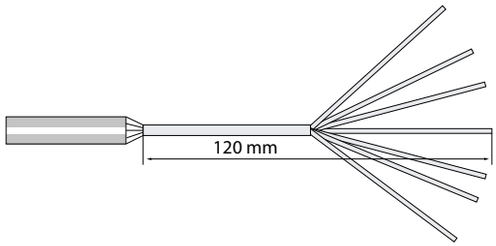
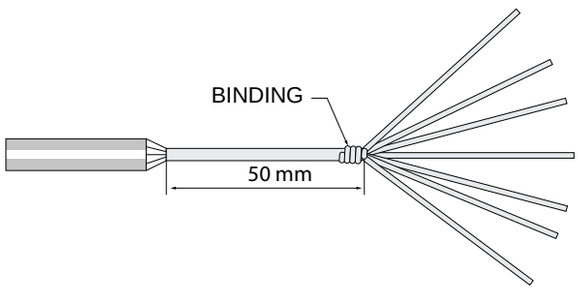
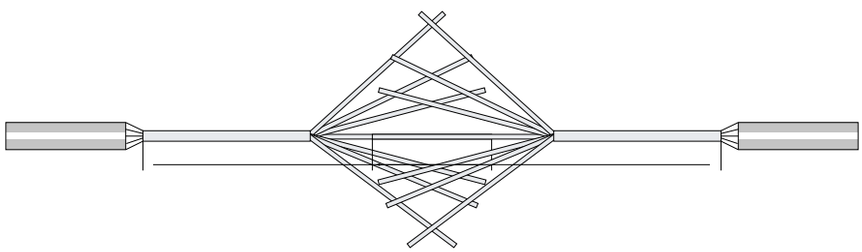


Step 5: Cut the center strand of the wire for 70 mm and twist closely.

Step 6: Bind on the twisted part of one wire end as shown below.



Step 7: Interlace the strands keeping the centres butt as shown below.



Step 8: Hold the wire end (which is not bind) in one hand and twist the strands of the other wire (bind one) over one by one, closely and tightly. Each strands are twisted half a turn at a time.

Step 9: Remove the bind which is made in step 6.

Step 10: Repeat the step 8 on the other side with the second wire end as shown below.

Task 3: Prepare Britannia T joints

Step 1: Take two pieces of hard drawn copper wire 4 mm with 0.2 m.

Step 2: With the help of the mallet straighten the wire.

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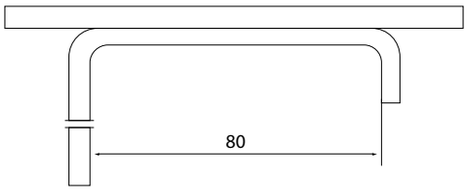
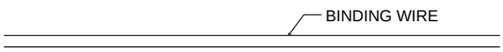
Step 3: Bend any one conductor at one end as shown below.



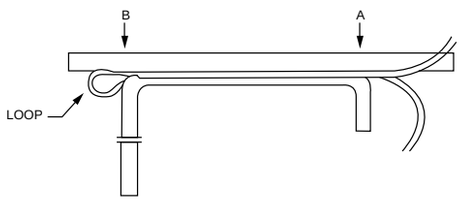
Step 4: Hold the two conductor to be joined with the help of hand vice.

Step 5: Take a binding wire and straighten it.



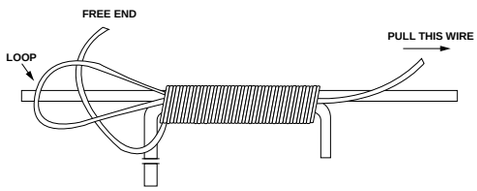
Step 6: Form a loop in binding wire leaving one end about 250 mm at the right side of the joint.

Step 7: Place the binding wire formed in the groove formed between the conductors as shown below.



Step 8: Start binding the wire tightly over the joint from position "A" to position "B".

Step 9: Insert the free end of the wire inside the loop as shown below.



Step 10: Grip the 250 mm loose end of the wire with a plier then carefully pull it. So that the loop and the free end of the wire go inside the joint.

Step 11: Wrap the free end over the conductor as shown below.

Result:

Thus, the various wiring joint such as simple twist joint, Married joint, Britannia T joints were done.

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EXPERIMENT

3 Verification of Ohm's law

Aim:

To determine the resistance value of two given coils of wire by using Ohm's law.

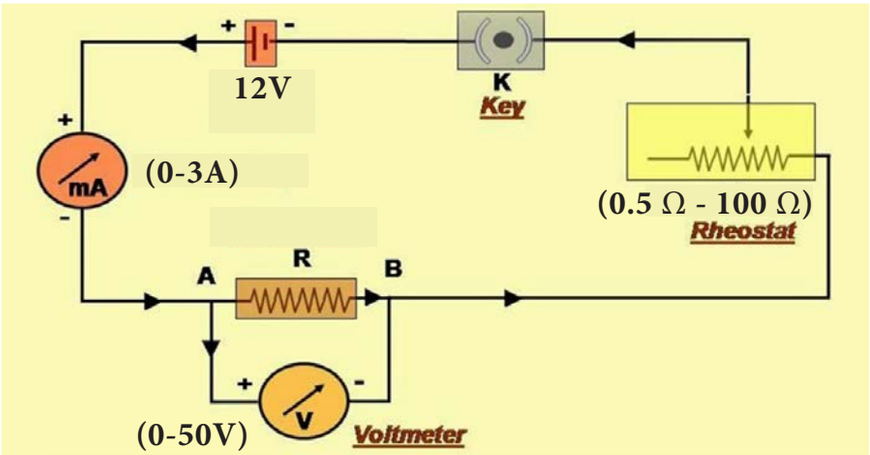
Tools and meterials required:

S.No	Name of the apparatus	Range	Quantity
1	Battery	12V	1
2	Plug key	One way	1
3	Ammeter	(0-5A), MC	1
4	Voltmeter	(0-50V), MC	1
5	Rheostat	0.5 Ω - 100 Ω	1
6	Resistance	5 Ω	1
7	Connecting wires	-	As required

Procedure:

Connect the circuit with the components as shown below.

After the connection is made check it with the subject faculty.



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Step 1: Keep the rheostat in Maximum resistance position.

Step 2: Record the corresponding volt and current readings.

Step 3: Take at least five set of readings, by varying the rheostat.

Step 4: With the help of ohm's law, $R = {}^{V}/_{I}$ determine the resistance value.

Step 5: Tabulate the readings as per the table given below.

Tabulation:

Sl. No	Voltage (volts)	Current (Amps)	Resistance (ohms)
1.			
2.			
3.			
4.			
5.			

Result:

The resistance of two coils of wire R1 = _____ohm.

R2 = _____ohm.

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EXPERIMENT

4 Appliance test board

Aim:

To know the method of testing of domestic appliances by using appliance test board.

Practical procedure:

Tips about test board

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Preparation of appliances test board

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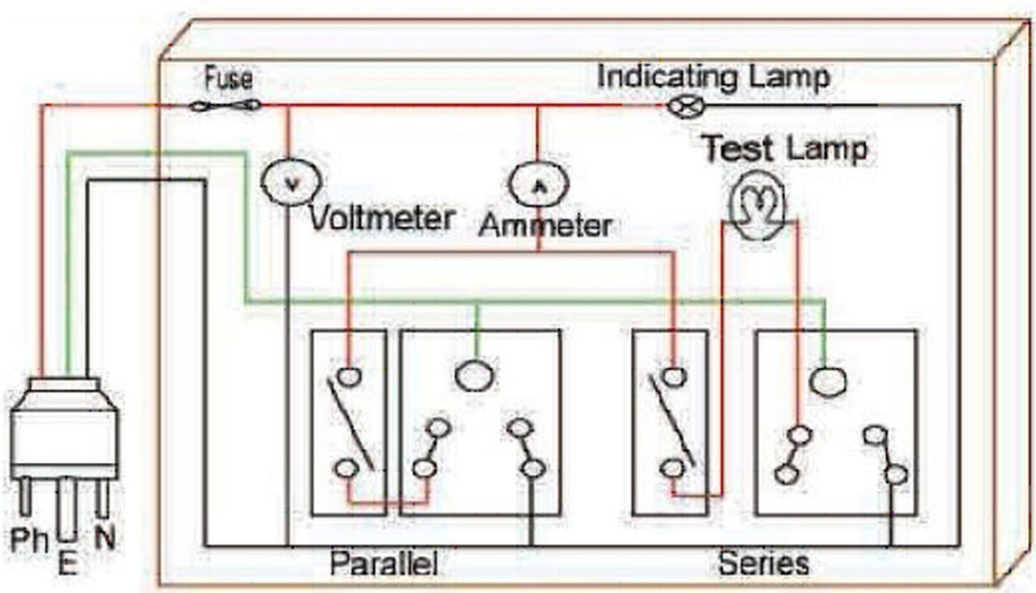
Testing for appliances test board

Procedure:



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Tools and materials required:

S.No	Name of the apparatus/ components	Range/value	Quantity
1	Screw driver	5 mm	1
2	Combinational plier	150 mm	1
3	Line tester	500V	1
4	Electrician knife	100 mm	1
5	Poker	100 mm	1
6	Electrical drilling machine	(6-12 mm) 230V, 350W	1
7	Ball peen hammer	-	1
8	Hacksaw frame with blade	300 mm	1
9	Wooden board	12" X 8"	(1 Piece)
10	Five pin socket	230V, 6A	2
11	Fuse unit	230V, 16A	1
12	One way switch	230V, 6A	2
13	Lamp holder	BC 230V	1
14	Lamp	230V, 200W	1
15	Three core power cord	15A	5 meter
16	Ammeter	(0-5A) MI	1
17	Voltmeter	(0-300V) MI	1
18	Copper wire	1/18	3 meter
19	Indicating lamp	230V	1
20	Three pin plug	230V, 15A	1

Task 1: To prepare an appliance test board individually

Step 1: Take required a size of a wooden board.

Step 2: Provide holes wherever necessary.

Step 3: Fix the switches, socket, fuse, indicator, ammeter and voltmeter properly.

Step 4: Make connection as per circuit diagram.

Task 2: To know the method of testing the appliance test board

Step 1: Connect the given appliances to the socket where test lamp is connected in series.

Step 2: The brightness of the lamp and the faults are specified below.

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S.No	Glow of lamp	Result
1	If the lamp glows at lesser brightness than as usual.	Appliance is in good condition.
2	If the lamp glows at its usual brightness	Appliance is short circuited.
3	If the lamp does not glow.	Appliance is open circuited.

Result:

- The method of testing the domestic appliance with the help of appliance test board was done properly.

  The value of current and voltage in ammeter and voltmeter are respectively.

  Current = _____ Amps

  Voltage = _____ Volts

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EXPERIMENT

5 One lamp controlled by a regulator

Aim:

To learn the method of doing one lamp controlled by a regulator and observe the illumination of the lamp.

Procedure:

Know the resistance offered by the regulator

↓

Connect the lamp with regulator

Tools and materials required:

S.No	Name of the apparatus/ components	Range/Value	Quantity
1	Multimeter (Digital)	AC supply (0 to 250 volts) A Resistance up to 50 Meg ohm.	1 No
2	Seven step non modular regulator	220V, 80W	1
3	Incandescent lamp	230V, 100W	1
4	PVC pipe	19 mm	5 Feet
5	PVC clamp	19 mm	4 No
6	Wooden screw	25 x 6 mm, 35 x 6 mm, 45 x 8 mm	Each 5 No
7	Teak wood box	4 x 4 inch	1 No
8	Round block PVC	3 ½ inch	1 No
9	Holder	Batten type	1 No
10	Copper wire multi strand	1 Sq.mm	As required
11	Wiring tool kit box		1 No
12	SPT switch	230V, 5A	1 No
13	Teak wood board	3½,' x 2½,'	1 No

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Task 1: To know the resistance offered by a regulator

Step 1: Collect all the required accessories and check the specification and its condition.

Step 2: Ensure the safety of work by wearing proper gloves.

Step 3: With the help of multi-meter, connect the rotatory switch resistance mode.

Step 4: Connect the red terminal of the multi-meter to one end of the regulator and black terminal to the other end.

Step 5: Measure the value of resistance offered by the regulator by adjusting it from minimum to maximum.

Task 2: Connect the lamp with regulator

Step 1: Regulator, switch, teak wood box are fitted accordingly with the help of tools and materials.

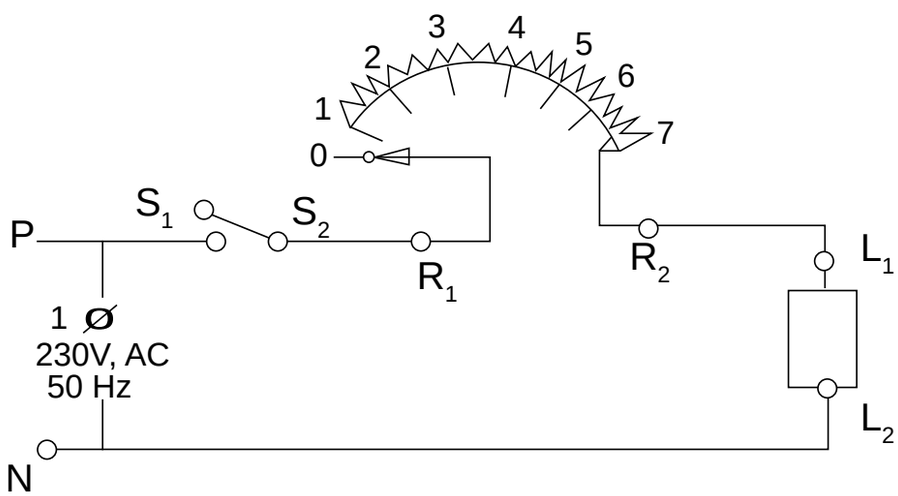
Step 2: Hole should be made for PVC pipe and wooden box, and smooth it with file.

Step 3: Fix tightly the PVC pipe of 1 feet length in the teak wood board for incoming supply.

Step 4: Fix the teak wood box with proper screws.

Step 5: Tight the PVC pipe of 1 Feet length is fixed vertically over the teak wood box.

Step 6: Fix the batten holder and the round block tightly.



Step 7: Do the connection diagram as per the circuit shown above.

Result:

Thus, the luminous output of the bulb was observed by connecting the regulator in series.

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EXPERIMENT

6 Staircase wiring

Aim:

To do the practical method of doing staircase wiring using 2 way switch.

Practical procedure:

Direct connection wiring

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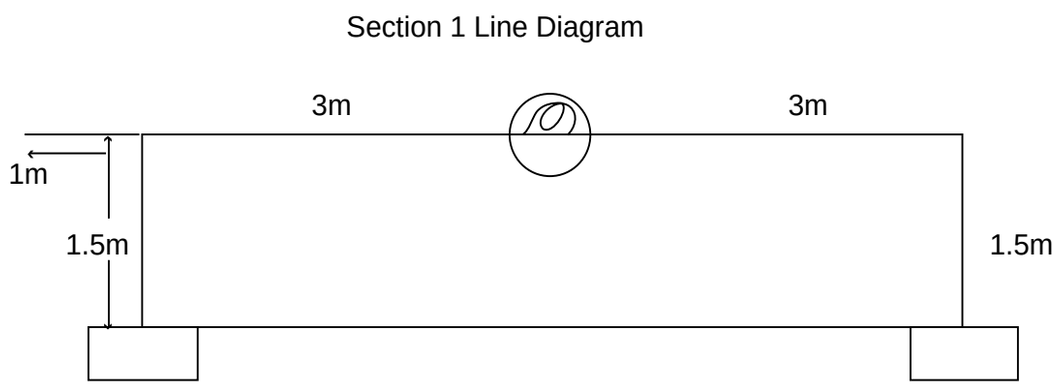
Cross connection wiring

Task 1: Direct connection wiring



Line diagram of direct connecton wiring

Tools and materials required:

Sl. No	Tools and materials	Range	Quantity
1	Screw driver set	All size	Each 1 No.
2	Combinational pliers (Insulated)	150 mm	1
3	Line tester	230V	1
4	Electrician knife	100 mm	1

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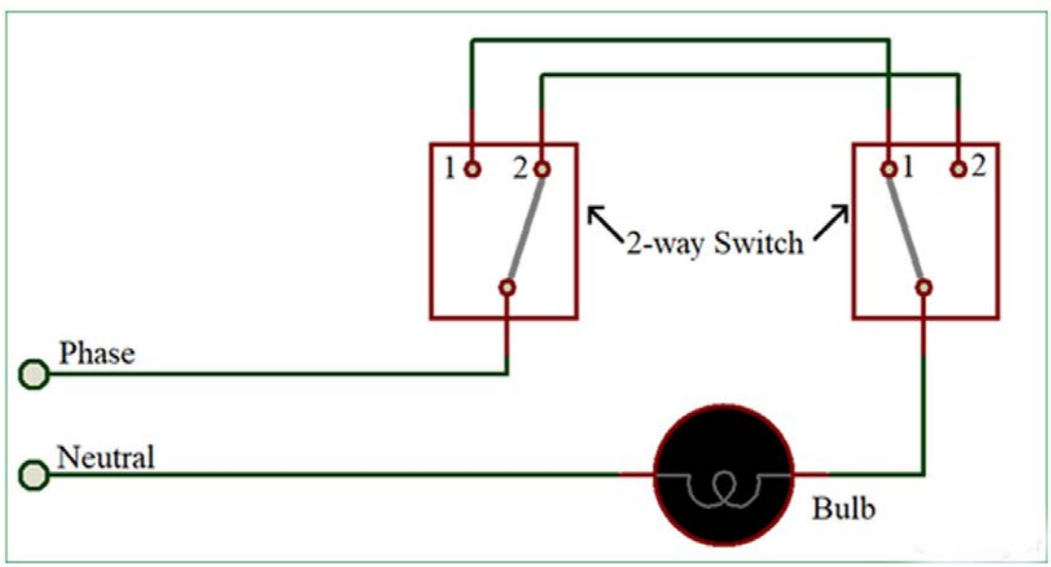
5	Electrical drilling machine	(6-12 mm) 350W	1
6	Ball peen hammer	0.5 kg	1
7	Hack saw blade	12”	1
8	Measuring tape	3 m	1
9	Poker	100 mm	1
10	Try square	Medium	1
11	Connector	-	1
12	Wooden box	4” x 4”	2
13	¾” PVC pipe	10 Feet	3 Nos.
14	1/18 Copper wire	1/18	20 Meter
15	‘L’ Bend	3/4”	5 Nos.
16	Two way switch	230V, 6A	2 Nos.
17	Holder	BC 230V	2 Nos.
18	Junction box	3 way	2 Nos.
19	3/4” clamps	3/4” inch	20 Nos.
20	Screws	1 inch	40 Nos.
21	Screws	1.5 inch	4 Nos.
22	Insulation tape	Roll	1
23	Bulb	230V, 60W	1

Procedure:



Step 1: Connect as per the circuit diagram.

Step 2: Connect phase wire directly to the center point of the first two way switch.

Step 3: The first terminal of the first two way switch is connected to the first terminal of the second two way switch.

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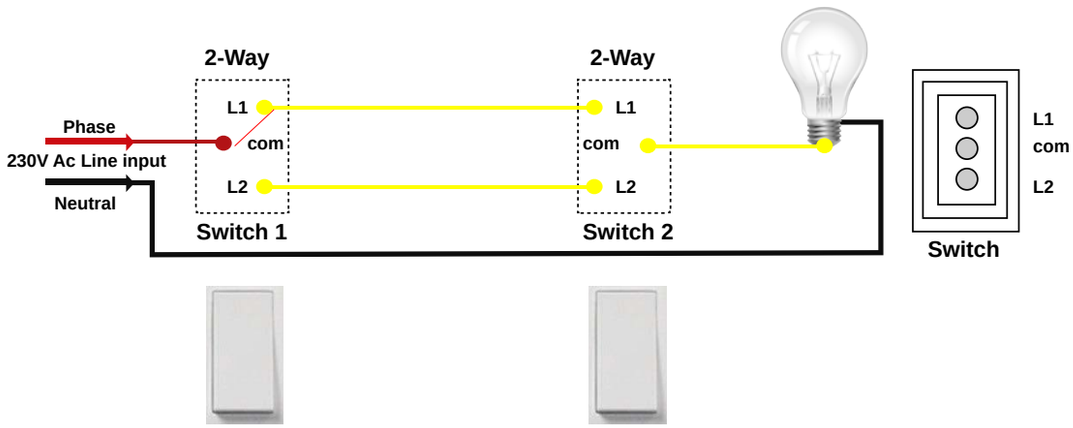
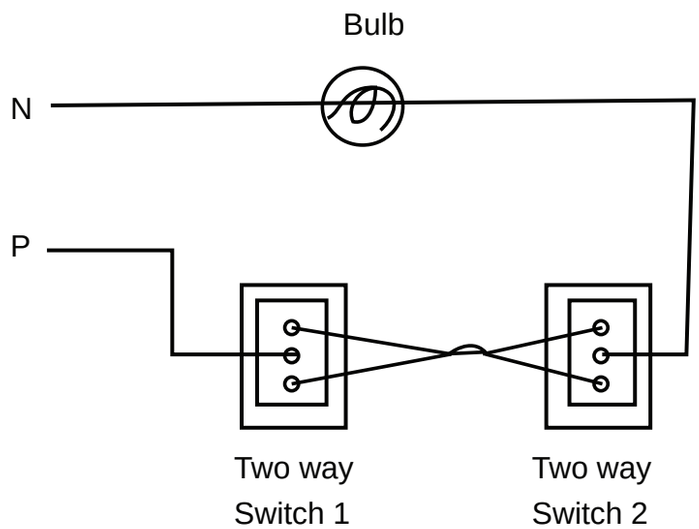
Step 4: Then the second terminal of the first two way switch is connected to second terminal of the second two way switch.

Step 5: The centre point of second switch is connected to one terminal of the bulb holder.

Step 6: Then, another terminal of the bulb is connected to the neutral wire.



Task 2: Cross connection wiring



Step 1: For cross connection, the first point of switch-1 is connected to the second point of switch-2.

Step 2: Then the second point of switch-1 is connected to the first point of switch-2.

Result:

The stair case wiring was completed and the lamps are glowing.

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EXPERIMENT

7 Godown wiring

Aim:

To do the godown wiring with line diagram.

Practical procedure:

Identification of line diagram

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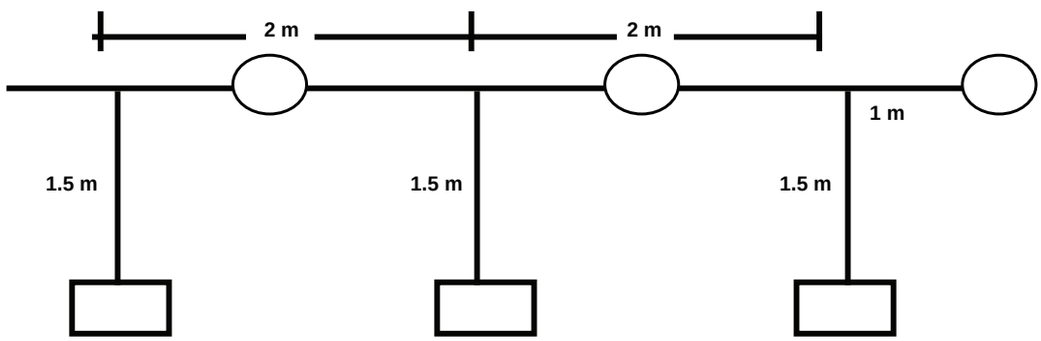
Connection of Godown wiring



Line diagram of godown wiring

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Tools and materials required:

Sl. No	Tools and materials	Range	Quantity
1	Screw driver Set	-	Set box
2	Combinational pliers	150 mm	1
3	Line tester	250V	1
4	Electrician knife	100 mm	1
5	Electrical drilling machine	(6-12 mm) 350W	1
6	Ball peen hammer	0.5 kg	1
7	Hack saw blade	12”	1
8	Measuring tape	3 m	1
9	Poker	100 mm	1
10	Try square	Medium	1
11	Connector	-	1
12	Wooden box	4” x 4”	4 Nos.
13	PVC pipes	10.0”	6 Nos.
14	Copper wire	1/18	40 Metre
15	‘L’ Bend	3/4”	12 Nos.
16	One way switch		1 No
17	Two way switch	230V, 6A	3 Nos.
18	Holder	230V, 6A	4 Nos.
19	Junction box (3 way)	BC 230V	4 Nos.
20	Clamps	3/4”	30 Nos.
21	Screws	1”	60 Nos.
22	Screws	1½ “	6 Nos.
23	Insulation tape	-	1 Roll
24	Bulb	60W	4 Nos.

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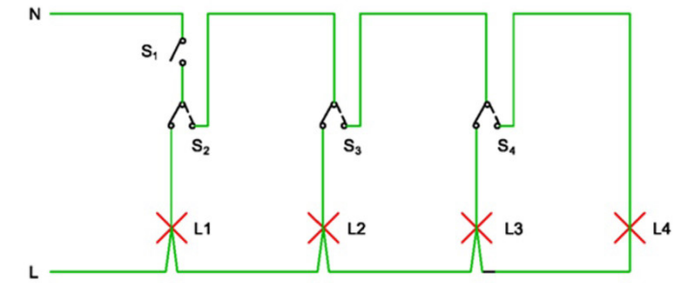
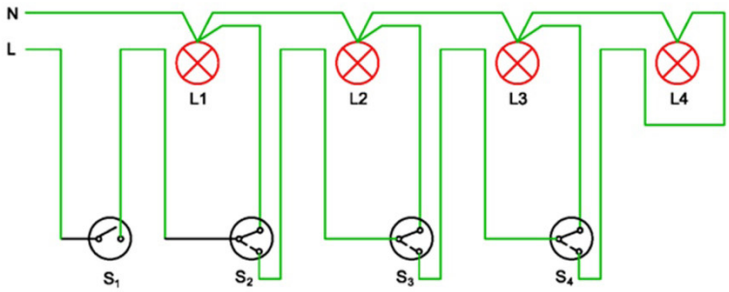
Procedure:

Task 1: Connection diagram for godown wiring

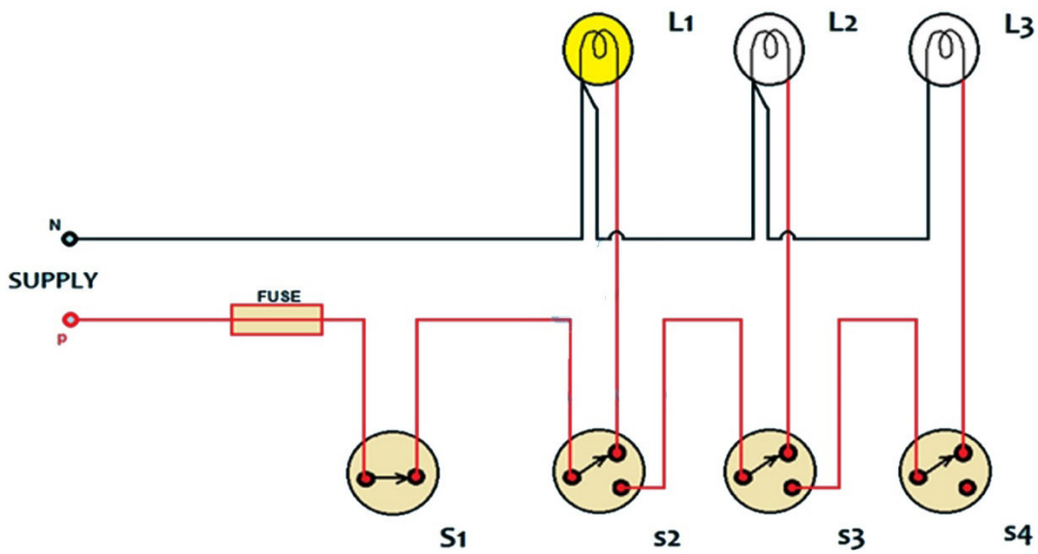


SCHEMATIC DIAGRAM OF GODOWN WIRING



WIRING DIAGRAM OF GODOWN WIRING

Step 1: Mark out the area where godown wiring has to be done.
Step 2: Fix the PVC pipe with clamps and screws and fix the junction box.
Step 3: Pull the wire with the help of spring inside the PVC pipe and connect switch properly.



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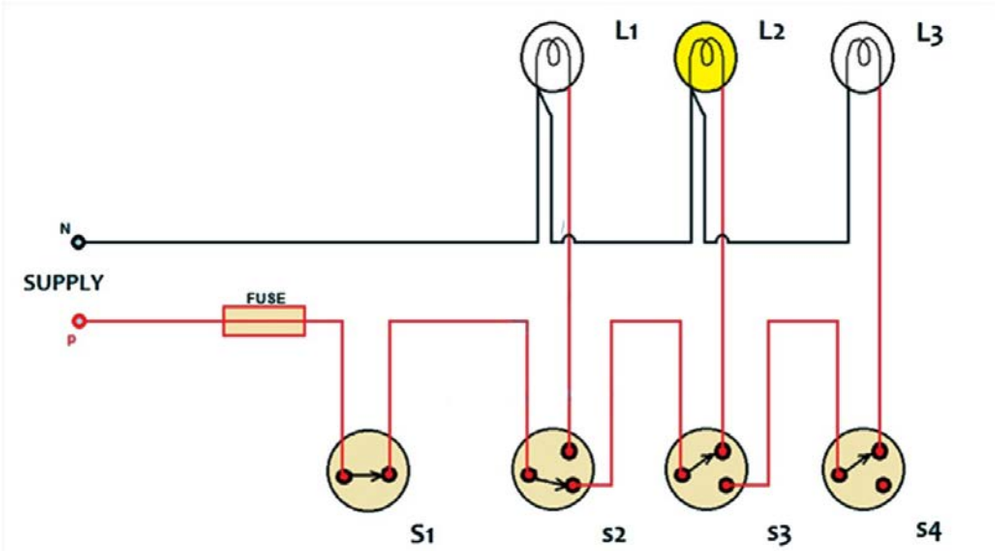
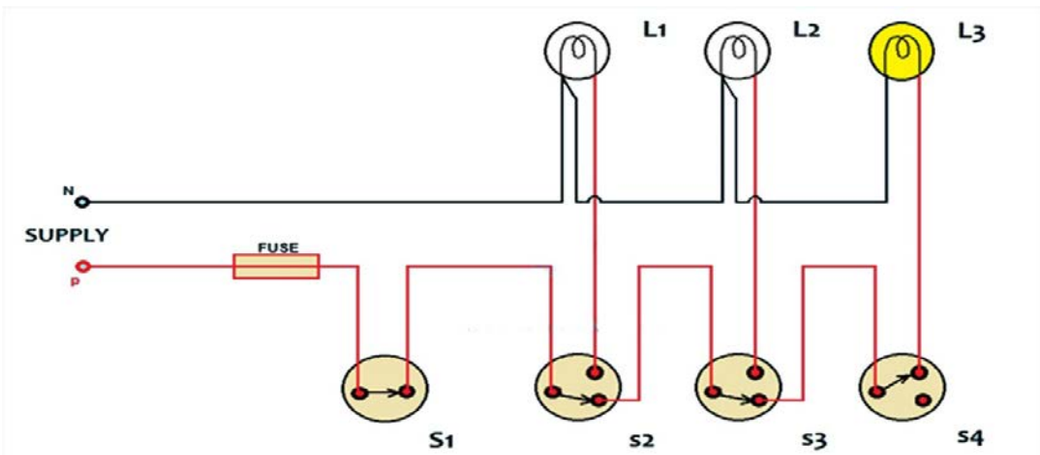
Step 4: The second terminal of the first two way switch is connected to the center point of the second two way switch.



Step 5: The second terminal of the second two way switch is connected to the center point of the third two way switch.



Step 6: Then the second terminal of the third two way switch is connected to one end of the bulb holder No. 4.

Step 7: One end of the third two way switch is connected to bulb holder No. 3.

Step 8: One end of the second two way switch is connected to the bulb holder No. 2.

Step 9: One end of the first two way switch is connected to the bulb holder No. 1.

Step 10: All the second terminal of the bulb holder 1, 2, 3 and 4 is connected to Neutral supply. Now the circuit is completed.

Result:

Thus, the method of doing Go-down wiring has been done by using line diagram.

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EXPERIMENT

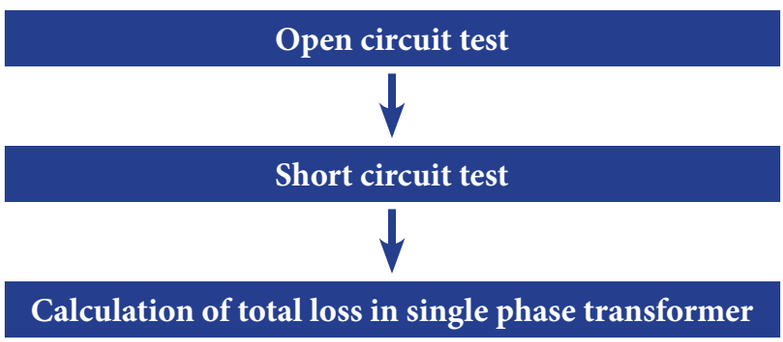
8

OC and SC test on single phase transformer

Aim:

To Conduct OC and SC test and calculate total loss in single phase transformer.

Practical procedure:



Tools and materials required:

S.No	Name of the Tools/ Equipments	Range/Value	Quantity
1	Voltmeter	(0-300V) MI	1 No
2	Ammeter	(0-10A) MI	1 No
3	Wattmeter	(0-150V) LPF (0-2A) Dynamometer type	1 No
4	Wattmeter	(0-300V) UPF (0-10A) Dynamometer type	1 No
5	Transformer single phase	1 KVA, 230/115 V	1 No
6	Autotransformer single phase	1KVA, (0 – 270)V	1 No
7	ICDP switch	230V, 10A	1 No
8	Copper wire	2 Sq.mm	As req.

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Procedure:

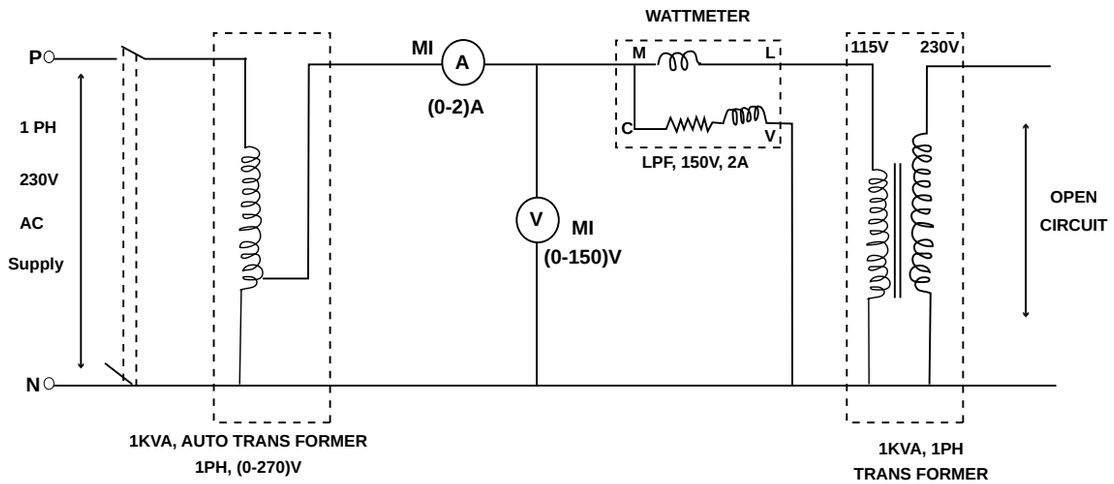
Note: OC test should always be conducted on the LV side and SC test should be on HV side.

Task 1: Open circuit test on single phase transformer

Step 1: Read the name plate details and identify the LV and HV sides of transformer.

Step 2: Connections are made as per the circuit diagram given below.

OPEN CIRCUIT TEST



Step 3: Before switching ON the supply, check whether the rotating knob in the auto transformer is in zero volt.

Step 4: Switch ON the ICDP.

Step 5: With help of auto transformer, gradually increase the voltage to the transformer up to rated voltage of LV side (115V).

Step 6: Note the meter readings in the table given below.

OPEN CIRCUIT TEST:

S.NO	Voc (Volts)	Ioc (Amps)	Woc(watts)
1			

Step 7: Gradually decrease to zero volt by auto-transformer then switch OFF the ICDP.

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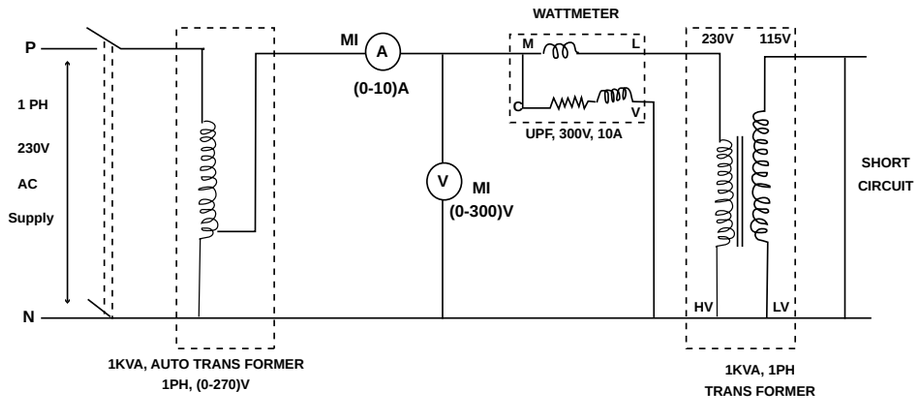
Task 2: SC test on single phase transformer

Step 1: Connections are made as per the circuit diagram given below.

Step 2: Make a short circuit between LV terminals as in the circuit diagram given below.

SHORT CIRCUIT TEST



Step 3: Before switching ON the supply check whether the rotating knob in the auto transformer is in zero volt.

Step 4: With help of auto transformer gradually increase the voltage to the rate of load current less than 10 A.

Step 5: Note the readings in the table given below.

SHORT CIRCUIT TEST:

S.NO	Vsc (Volts)	If (Amps)	Isc (Amps)	Wsc(watts)

Step 6: Gradually decrease the voltage to the zero value by auto-transformer then switch OFF the ICDP.

Step 7: Calculate the full load loss by adding both wattmeter reading measured from open circuit and short circuit test.

Task 3:

The full load losses in the single phase transformer is calculated and given below,

i) Iron loss = _____watts

ii) Copper loss = _____watts

iii) Total Loss = _____watts

Result:

The OC and SC test for a single phase transformer is conducted and calculated its total loss

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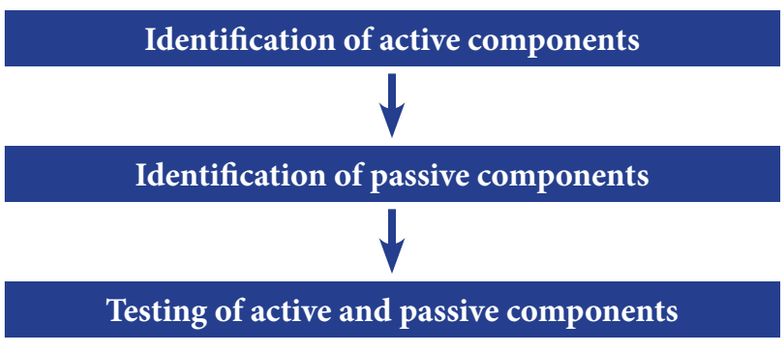
EXPERIMENT

9 Testing of Active and Passive components

Aim:

To test the terminals of active and passive components.

Practical procedure:



Tools and materials required:

S.No	Name of the tools/Instruments	Range	Quantity
1	Digital multi meter	AC/DC	1 No
2	Diode	1N4001	1 No
3	Transistor	BC547, BC557	Each 1 No
4	SCR	TYN 616	1 No
5	Carbon composition resistor	1000 0hms	1 No
6	Inductor	100 mh	1 No
7	Capacitor	63V, 100uf	1 No

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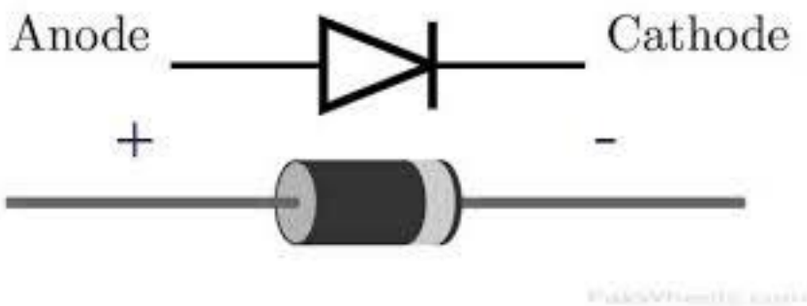
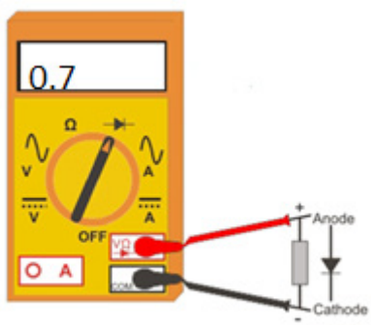
Procedure 1: Identifying and testing of Active components:

Task 1: Testing the diode



Step 1: Set the multi meter in diode position using selector switch.

Step 2: Place the red and black lead of the multi meter to the anode and cathode i.e. forward bias). Note the reading and verify with table 1.



Step 3: Now reverse the multi meter leads, red and black to cathode and anode of the diode respectively. (i.e. Reverse bias). Note the reading and verify it with table 1.

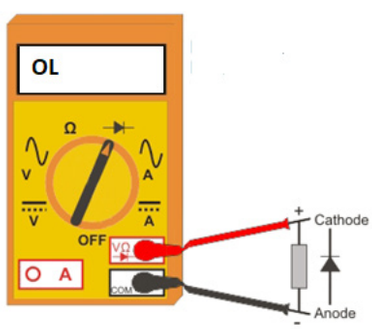


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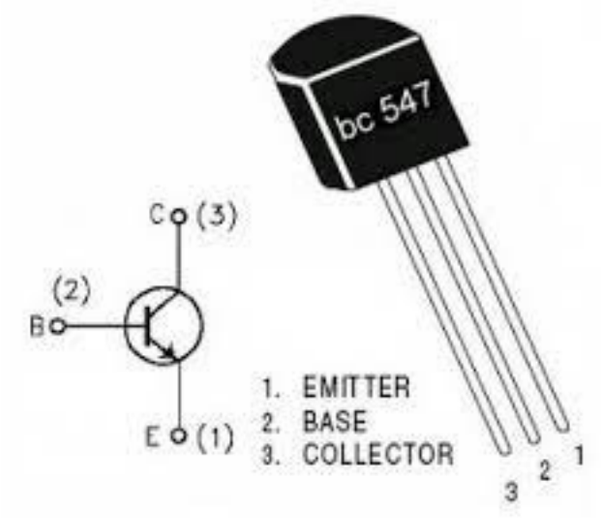
Table 1:

	Multi meter leads			
S.No	Red (Positive)	Black (Negative)	Mode of operation	Multi meter reading
1	Anode	Cathode	Forward bias	0.7
2	Cathode	Anode	Reverse bias	OL (Open Loop)

Step 4: If the reading matches with table 1, then the diode is in good condition, else diode is defective.

Task 2: Testing the NPN transistor

Step 1: Identify the terminals of NPN transistor (BC 547) Emitter, Base and Collector from the data sheet.



Step 2: Set the multi meter in diode test position using selector switch.

Step 3: Place the red and black lead of multi meter on the base and emitter terminal of the transistor respectively. (i.e. forward bias). Note the reading and verify with table 2.

Step 4: Reverse the multi meter leads red and black on emitter and base terminal of transistor respectively. (i.e. reverse bias). Note the reading and verify with table 2.

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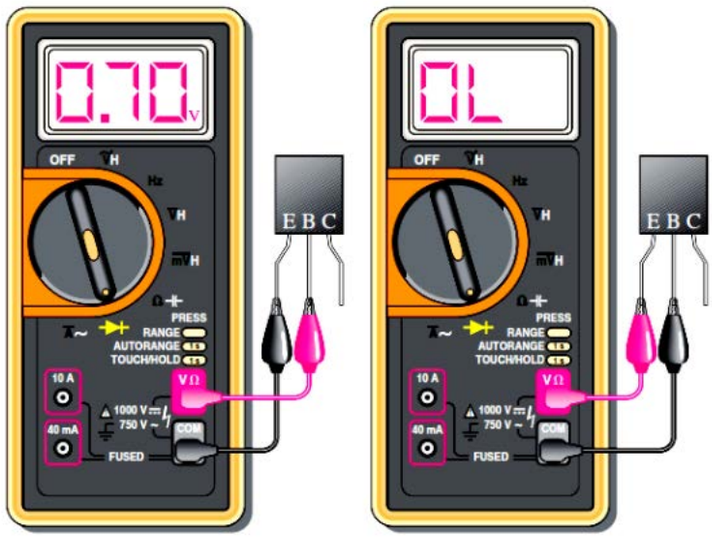

Step 5: Place the red and black lead of multi meter to the base and collector terminal of transistor respectively (i.e. forward bias). Note the readings and verify with table 2.

Step 6: Reverse the multi meter leads, with red and black of multi meter to the collector and base terminal of transistor respectively. (i.e. reverse bias) and verify the reading with table 2.

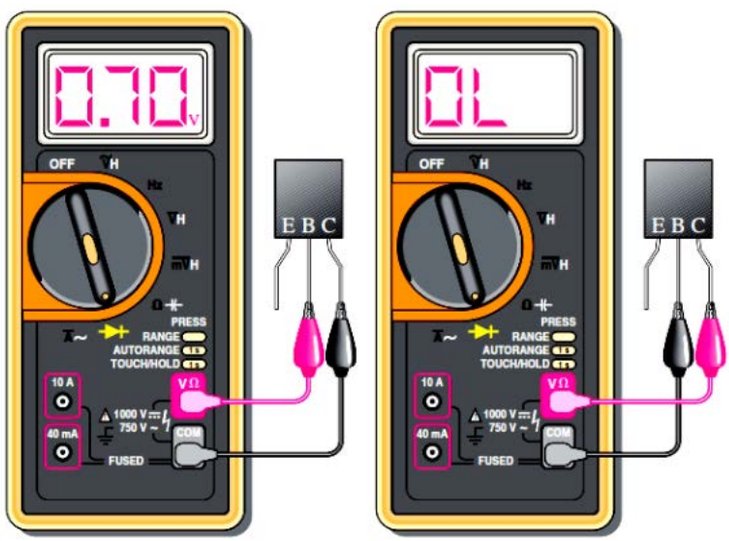

Table 2:

	Multi meter leads			
S.No	Red (Positive)	Black (Negative)	Mode of operation	Multi meter reading
1	Base	Emitter	Forward bias	0.7
2	Emitter	Base	Reverse bias	OL (Open Loop)
3	Base	Collector	Forward bias	0.7
4	Collector	Base	Reverse bias	OL (Open Loop)

Step 7: If the measured reading does not match with Table – 2, then the transistor is defective.

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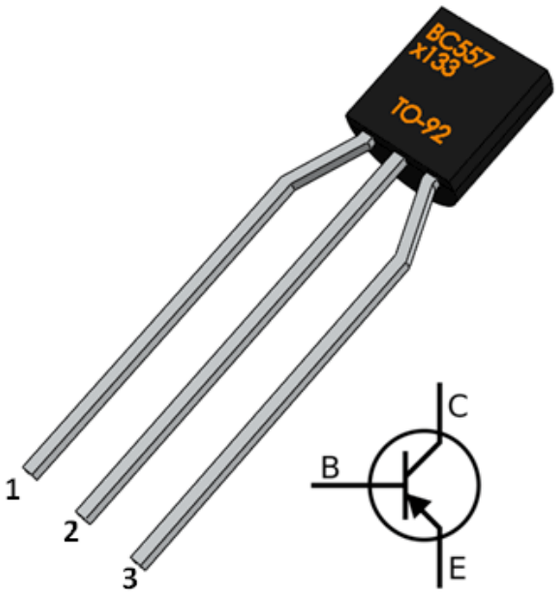
Task 3: Testing the PNP transistor

Step 1: Identify the terminals of PNP transistor (BC 557) Emitter, Base and Collector from the data sheet.



BC-557	
1	Collector
2	Base
3	Emitter

Step 2: Set the multi meter in diode testing position.

Step 3: Place the multi meter leads between the terminal of PNP transistor as shown in table 3 and verify the reading.

Table 3:

	Multi meter leads			
S.No	Red (Positive)	Black (Negative)	Mode of operation	Multi meter reading
1	Collector	Base	Forward bias	0.7
2	Base	Collector	Reverse bias	OL (Open Loop)
3	Emitter	Base	Forward bias	0.7
4	Base	Emitter	Reverse bias	OL (Open Loop)

Step 4: If the readings does not match with the table, then the transistor is defective.

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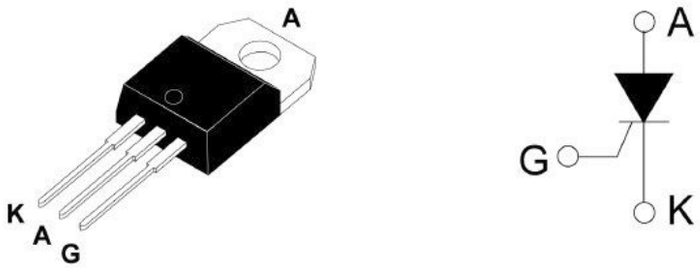
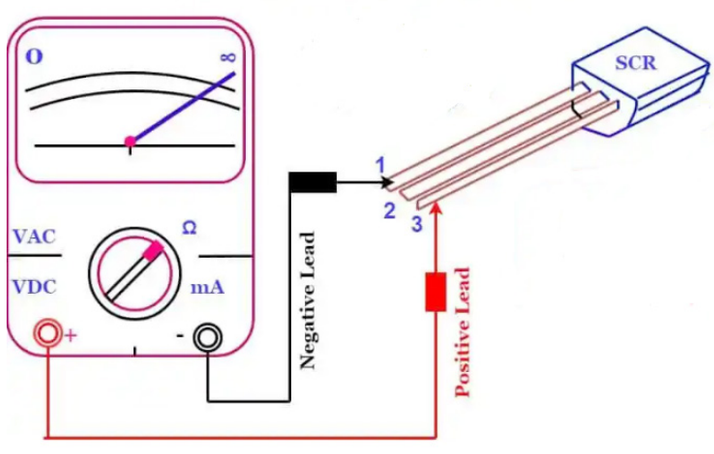
Task 4: Testing the SCR

Step 1: Identify the SCR (TYN 616) terminals Anode, Cathode and Gate from the data sheet.



Step 2: Set the multi meter in resistance mode by using selector switch.

Step 3: Place the red and black lead of multi meter at anode and cathode terminals of SCR respectively (forward blocking mode). Note and verify the readings with table 4.



Step 4: Place the red and black lead of multi meter at anode and cathode terminal with a short between anode and gate terminal (with small wire) of SCR (forward conducting mode). Note and verify the reading with Table 4.

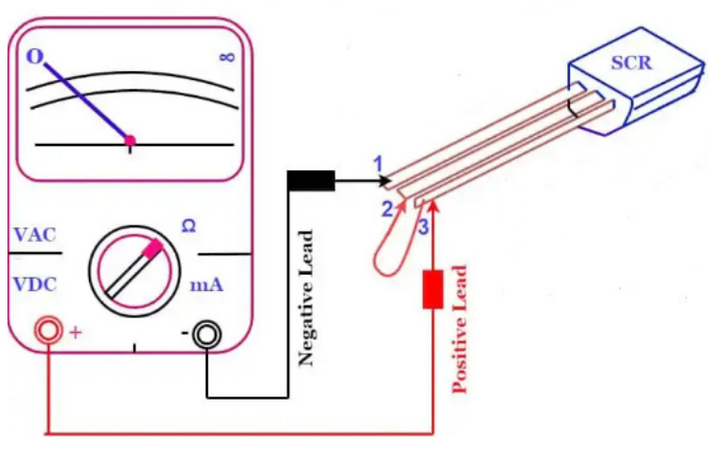


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Table 4:

S.No	Multi meter leads		Mode of operation	Multi meter reading
	Red (Positive)	Black (Negative)		
1	Anode	Cathode	Forward blocking mode	infinity
2	Anode, Gate	Cathode	Forward conducting mode	0

Step 5: If the measured reading does not match with table 4, then the SCR is defective.

Procedure 2: Testing of passive components:

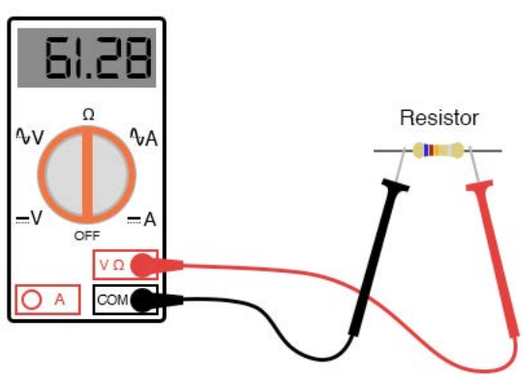
Task 1: Testing the resistors

Step 1: Take a metal film resistor and calculate its value by using colour code.

Step 2: Set the multi meter in ohms range that is equal to or higher than the value of the resistor to be tested.

Step 3: Place the red and black leads of multi meter at the two end of resistor (since resistors don't have polarity).

Step 4: Note and verify the reading from the multi meter with calculated one. If both the values are same, then the resistor is in good condition.



Step 5: If not displayed on the multi meter, then the resistor is defective.

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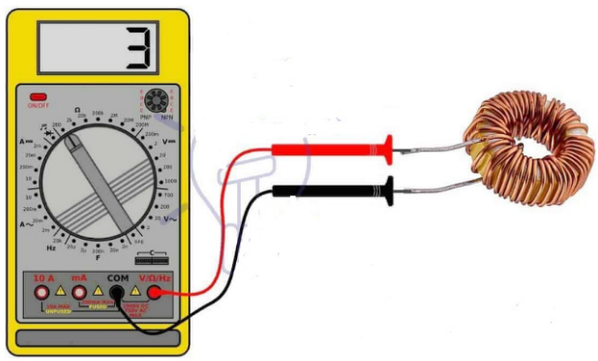
Task 2: Testing the inductor

Step 1: Set the multi meter in resistance mode at least range.

Step 2: Place the multi meter leads across the inductor leads. (since we are measuring the resistance) Note the reading and ensure the resistance value not more than 10 Ω.



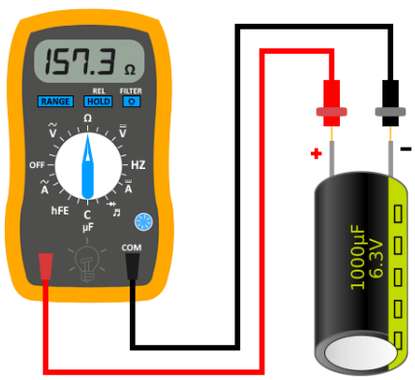
Step 3: If the multi meter does not shows any value on the resistance value lies more than 10 Ω, then the inductor is defective.

Task 3: Testing the capacitor

Step 1: Set the multi meter in resistance mode (at least for 1000 Ω).

Step 2: Place red and black leads of multi meter to the positive and negative terminal of capacitor respectively without changing the polarity.

Step 3: If the multi meter shows some readings and immediately it will return to OL (Open Loop) or infinity, then the capacitor is in good condition.



Step 4: If the multi meter reading remains constant, then the capacitor is defective.

Result:

The active and passive components were identified and tested.

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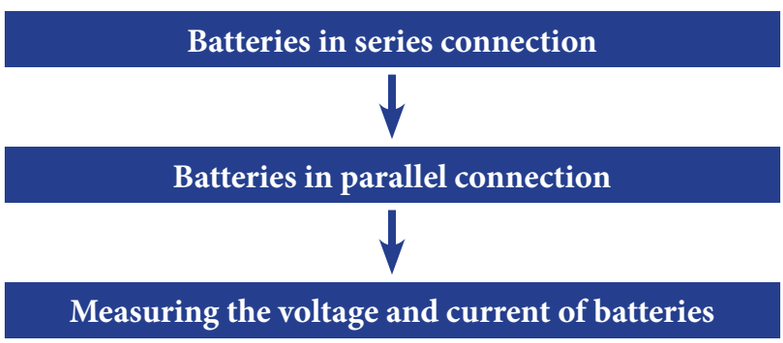
EXPERIMENT

10 Series and Parallel connections of batteries

Aim:

Calculate the Voltage and current rating of batteries in series and parallel connections.

Practical procedure:



Tools and materials required:

S.No	Name of the tools/Equipment	Range/Value	Quantity
1	Rechargeable lead acid battery	12 V, 7 AH	3 Nos
2	Voltmeter	(0 – 50V) MC	1 No
3	Multimeter	(0 – 100V)	1 No
4	Connecting leads (or) Cables with crocodile clips	1.5 Sq.mm.	As required

Task 1: Connecting batteries in series

Step 1: Check all the batteries are having the same ampere hour rating.

Step 2: Name the battery as A, B and C.

Step 3: Connect the negative terminal of battery (A) to the positive terminal of another (B) and so on until all the three batteries are connected as shown Measure the voltage and current using voltmeter/multimeter.

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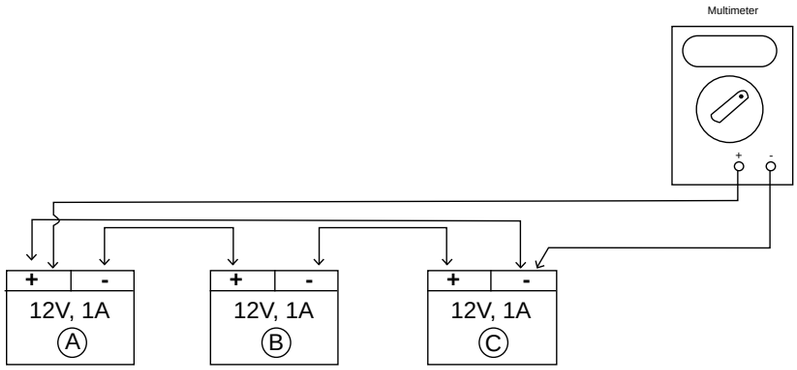


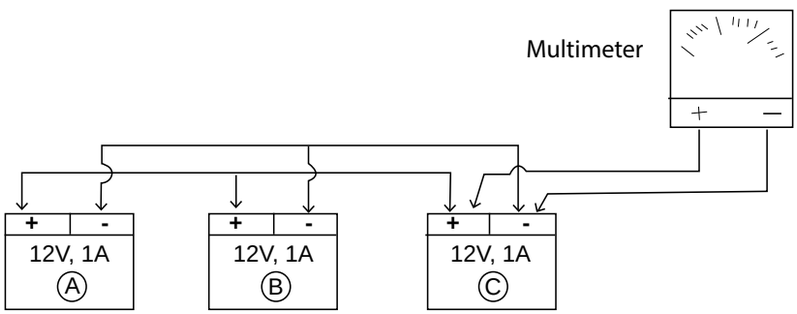
Step 4: Measure the voltage by applying positive and negative terminals of voltmeter to (any of the) positive and negative terminals of series connected batteries with same polarity as shown below.

Step 5: Note down the readings in below table.

S.No	Model of connection	Voltage	Current
1	Series		

Task 2: Connecting batteries in parallel

Step 1: Measure the voltage with voltmeter by connecting positive and negative terminal to any of the positive and negative terminal of parallel connected batteries as shown below.



Step 2: Note down the readings in below table.

S.No	Model of connection	Voltage	Current
1	Parallel		

Result:

The batteries are connected in series and in parallel, voltage and current values are measured and calculated.

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EXPERIMENT

11 Three phase star connection

Aim:

To connect and verify the load in star connection.

To verify the relationship between Line and Phase values in star connection.

Practical procedure:

Circuit connection diagram

↓

Measuring the voltage values

Tools and materials required:

S.No	Name of the tools/Equipment	Range/Value	Quantity
1	Screwdriver	150mm	1 No
2	Combination plier	150 mm	1 No
3	Ammeter	Amp MI	2 Nos
4	Voltmeter	(0 – 500) Volts MI	2 Nos
5	3 Pole MCB	6A,440 volts	1 No
6	BC lamp	100W, 230V	3 Nos
7	BC lamp	200W, 230V	3 Nos
8	Copper wire	1.5 Sq.mm	As Req

Procedure:

Task 1: Circuit diagram

Step 1: Connect the circuit as per the diagram. with one lamp each connected to all the 3 phase (100/200W).

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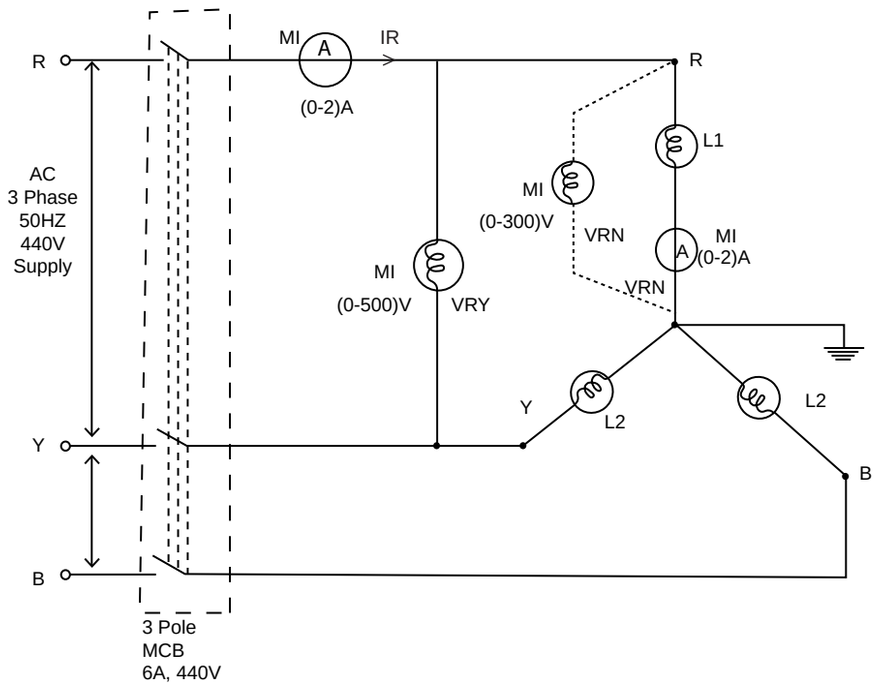
STAR CONNECTED NETWORK



Step 2: Identify the 3-phase and neutral of the supply terminals.

Task 2: Measuring the voltage values

Step 1: Switch ON the 3-phase supply.

Step 2: Measure the line voltage V_{RY} by placing the voltmeter leads between the two lines R and Y. Note the readings in table 1.

Step 3: Repeat the step 4 to measure other line voltages V_{YB} and V_{BR}.

Step 4: Measure the phase voltage by placing the voltmeter leads between one line and star point N and note the readings in table 1.

Step 5: Measure the phase and line current from the ammeters and note the reading in table 1.

Step 6: Repeat the steps from 3 to 7 for various loads (100w, 200w).

Table 1:

S.No	Load in watts per phase	Line voltage			Phase voltage			Line current			Phase current		
		V_{RY}	V_{YB}	V_{BR}	V_{RN}	V_{YN}	V_{BN}	I_R	I_Y	I_B	I_{RN}	I_{YB}	I_{BN}
1	100W												
2	200W												

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Step 7: Calculate the ratio between line and phase voltage and ensure the values are around 1.732 V.

Step 8: Verify the line current and phase current and ensure the values are unity.

Result:

From the calucations it was observed that the line and phase currents are same (I_L = Iph) and line voltage is 1.732 times that of the phase voltage (V_L = 1.732 Vph).

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EXPERIMENT

12 Three phase delta connection

Aim:

To connect the loads in delta connection.

To verify the relationship between line and phase values in delta connection.

Practical procedure:

Circuit connection diagram

↓

Measuring the voltage values

Tools and materials required:

S.No	Name of the Tools/Equipment	Range/Value	Quantity
1	Screw driver	150 mm	1 No
2	Combination plier	150 mm	1 No
3	Ammeter	(0-2A) MI	2 Nos
4	MI Voltmeter	(0 – 500V) MI	2 Nos
5	3 Pole MCB	6A,440 volts	1 No
6	BC lamp	100W, 230V	6 Nos
7	BC lamp	200W, 230V	6 Nos
8	Copper wire	1.5 Sq.mm	As Req

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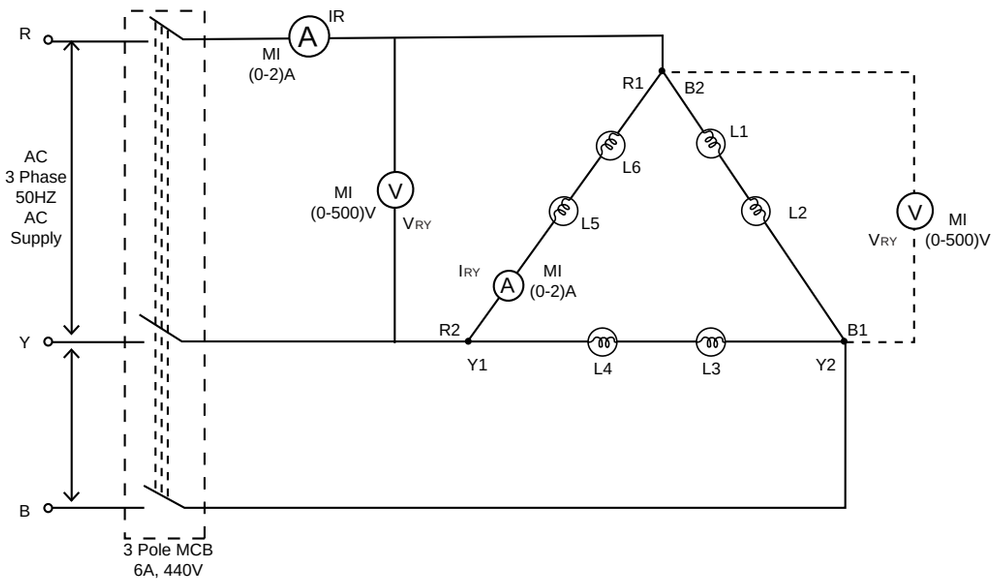
Procedure:

Task 1: Circuit diagram

Step 1: Connect the circuit as per the diagram given below. Two lamps in series to be connected between two phases of the same voltage.

DELTA CONNECTED NETWORK



Step 2: Identify the 3-phase and neutral with the supply terminals.

Task 2: Measuring the voltage values

Step 1: Switch ON the 3-phase supply.

Step 2: Measure the line voltage by connecting the voltmeter leads between the two lines R_1, Y_1, B_1.

Step 3: Measure the phase voltage in the voltmeter across R_1 and R_2 or Y_1 and Y_2 or B_1 and B_2.

Step 4: Measure the line current from ammeter connected between supply and load.

Step 5: Measure the phase and line current from the ammeter connected in single load terminal (Two lamps connected in series) Note the readings in Table 1. .

Step 6: Repeat the steps from 3 to 7 for various loads (100w, 200w).

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Table 1:

S.No	Load in watts per phase	Line voltage			Phase voltage			Line current			Phase current		
		V_{RY}	V_{YB}	V_{BR}	V_{RN}	V_{YN}	V_{BN}	I_R	I_Y	I_B	I_{RN}	I_{YB}	I_{BN}
1	100W												
2	200W												

Step 7: Calculate the ratio between line and phase voltage and ensure the ratios are unity.

Step 8: Verify the line current and phase current and ensure the values are around 1.732 A.

Result:

The relationship between line and phase values in delta connections are verified. The line voltage and phase voltages are same. Line current (I_L) is 1.732 times greater than the phase current (I_{PH}) in the delta connection.

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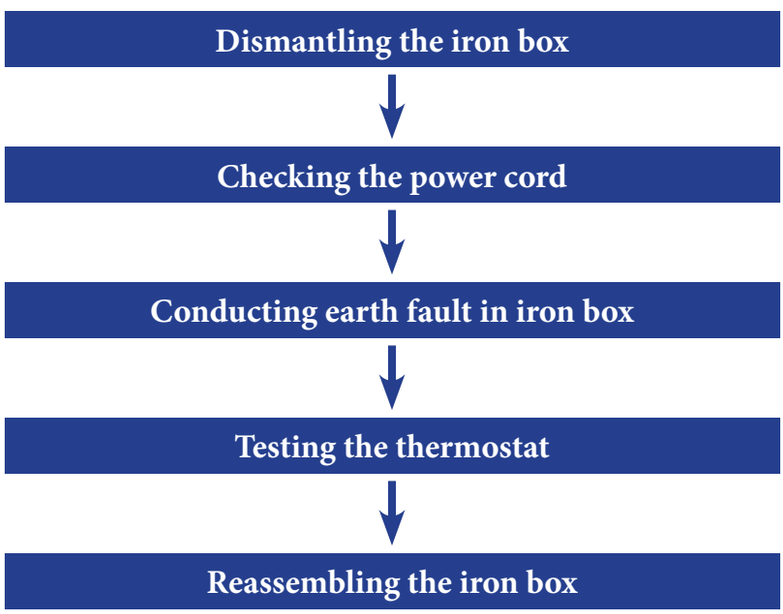
EXPERIMENT

13 Automatic iron box

Aim:

To dismantle, identifying the parts, testing and reassembling of an iron box.

Practical procedure:



Tools and materials required:

S.No	Particulars	Range	Quantity
1	Combination Plier	200 mm	1 No
2	Screw driver	3 to 6 mm	1 Set
3	Automatic iron box	750W	1 No
4	Test lamp	230V, 60W	1 No
5	Appliance test board	230V, 6A	1 No
6	Copper wire	1.5 sq.mm	as req.

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Procedure:

Task 1: Dismantling the iron box

Step1: Unscrew the housing of iron box with appropriate tool.

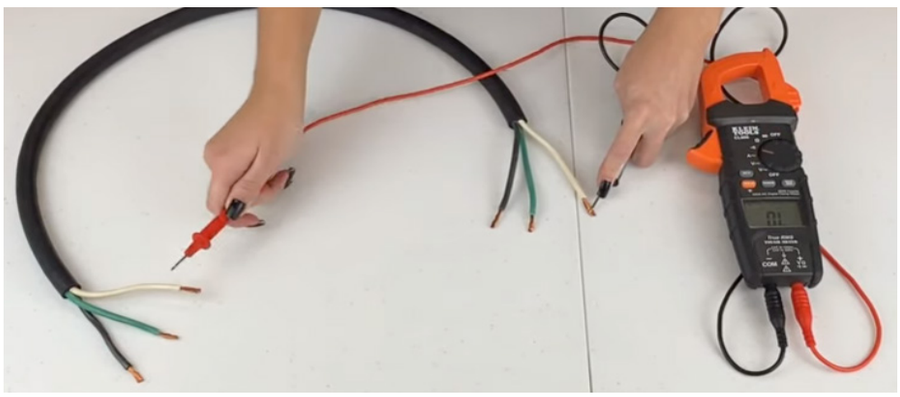
Step 2: Remove the 3 core power cable connected to the heating element via thermostat. Note down the terminals where phase, neutral and earth (body) wires are connected.

Task 2: Testing the power cord

Step 1: Conduct the continuity and short circuit test in the power cord.

Step 2: Place the test lamp between each terminal in 3 pin top and ensure that no short circuit occurs between phase, neutral and earth.

Step 3: Place the test lamp between one terminal in three pin top and other end of power cord at same wire to ensure the continuity.(Check with all three wires).



Step 4: you can also use multimeter in continuity mode to check continuity and short circuit in power cord

Task 3: Conducting Earth fault test in the iron box

Step 1: Isolate the power supply from the iron box.

Step 2: Place a test lamp between metal body of iron box and each terminal (phase, neutral and earth) one by one in 3 pin top as shown below.

Step 3: If lamps glows, then earth fault exists in the circuit, Replace the power cord with good one.

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Task 4: Testing the thermostat

Step 1: Remove the indicator connected across the thermostat. Test the indicator lamp with test lamp. If it not glow, replace it.

Step 2: Manually test the thermostat, heating element and sole plate.

Step 3: Dismantle the thermostat from the heating element.

Step 4: Check the thermostat manually whether any moving contact is connected with bimetallic strip.

Step 5: Check the knob by rotating with free hand and ensure it is working smoothly.

Step 6: Connect the thermostat and indicator lamp in series with the heating element.

Step 7: Connect the supply to the heating element. Adjust the knob and ensure that the thermostat is working properly.

Task 5: Reassembling the iron box

Reassembling the parts in reverse process as done in dismantling. Ensure that now parts were left out.

Result:

The Iron box was dismantled, reassembled and tested. Now it is working in good condition.

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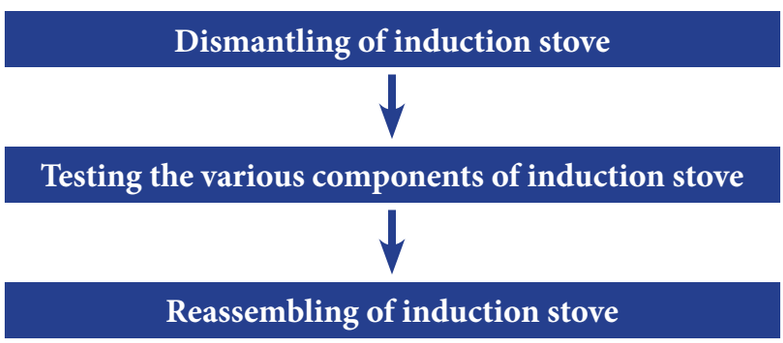
EXPERIMENT

14 Induction stove

Aim:

To dismantle, test and reassemble the induction stove.

Practical procedure:



Tools and materials required:

S.No	Name of the Tool/Equipment	Range/Value	Quantity
1	Screw driver	300 mm	1 No
2	Combination plier	200 mm	1 No
3	Long nose plier	150 mm	1 No
4	Cotton waste		As required
5	Induction stove	1800W	1 No
6	Digital multi meter	AC/DC	1 No
7	Emery sheet	500	1 No

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Procedure:

Task 1: Dismantling procedure of an induction stove

Step 1: Note down the specifications in name plate details and separate it.

Step 2: Disconnect the power supply of the Induction stove and ensure that it has no power.

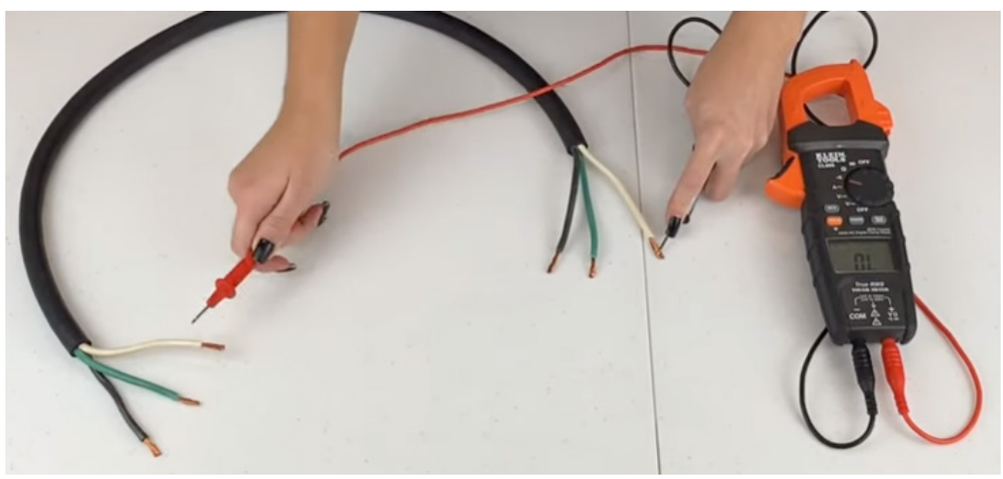
Step 3: Unscrew the power supply in the induction stove and remove the power cord.

Step 4: Remove the induction stove top separately with the body.

Task 2: Testing the components

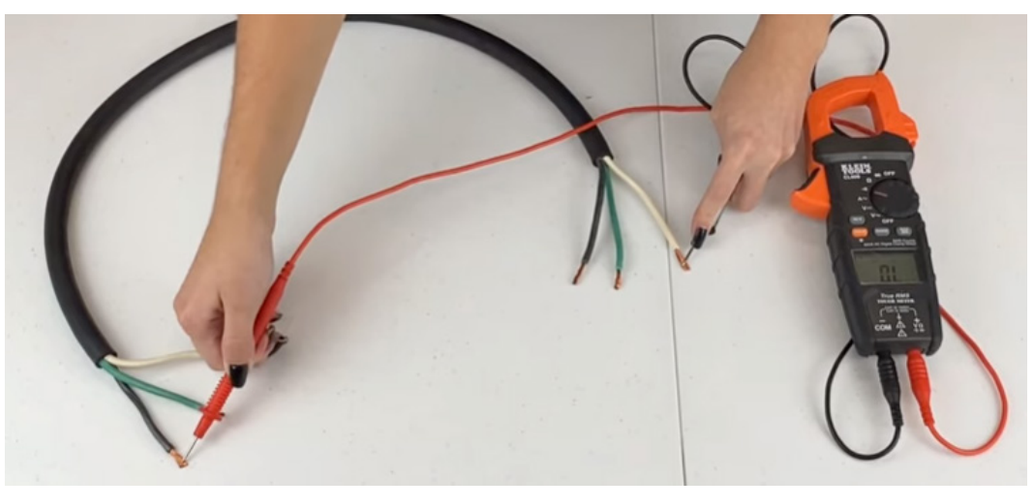
Step 1: Continuity test.

Test the power cord with multi meter and ensure it is in continuity. If the continuity of the cord is not correct, replace a new one.



Step 2: Open and Short circuit test.

While connecting the power cord terminal with multi meter, if the value is displayed in the meter, it indicates the appliance is in good condition. If there is no value it indicates the open circuit.



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When we connect the two leads of the multi meter with the induction stove, if beep sound occurs, that indicates the short circuit in the appliance. Then remedial measure has to be taken to clear the fault.

Step 3: Check the fuse with multi meter by setting it in continuity mode, if beep occurs then fuse is ok or otherwise replace it.

Step 4: Check the Bridge rectifier IC by setting the multi meter in continuity mode and know whether it is in good condition. If any defects in IC, replace it.

Step 5: Check the IGBT terminal with the help of multi meter. If any defect in it, replace it.

Step 6: Check the induction coil terminal visually, and if any defects in it be replaced.

Step 7: Ensure all the defective components in the stove are replace it with specific rating.

Step 8: Assemble the parts in reverse process as dismantled.

Step 9: Now test the appliance induction stove with supply.

Result:

The method of dismantling, reassembling and testing of an induction stove was done systematically and now the appliance is working in good condition.

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EXPERIMENT

15 Geyser

Aim:

To know the method of dismantling, testing and reassembling of a geyser

Dismantling the geyser

↓

Testing the various components

↓

Reassembling the geyser

Tools, materials and instruments:

S.No	Name of the Tools/Equipment	Range/Value	Quantity
1	Insulated screw driver	300 mm	1 No
2	Insulated combination plier	200 mm	1 No
3	Insulated long nose plier	150 mm	1 No
4	Cotton waste		as required
5	Geyser	2000W	1 No
6	Series test lamp board with test probe	230V	1 No
7	Incandescent lamp	230V, 100W	1 No
8	Multi meter		1 No
9	Emery sheet	500	1 No

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Procedure:

Task 1: Dismantling the geyser

1. Disconnect the water inlet from the tank or close the inlet valve.
2. Switch off the power supply before dismantling and remove power cord.
3. Remove thermostat and heating element.

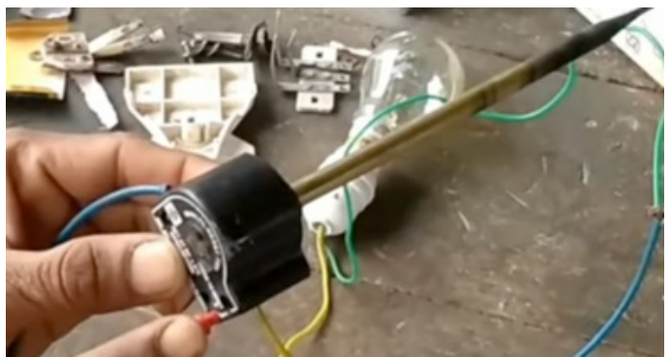
Task 2: Testing the components of a geyser

Step 1: Check the power cord of the geyser with Multimeter. (set the Multimeter to the beep continuity mode).

Continuity test: Place the multimeter red probe to the power cord line terminal one end and place the other end of multimeter black color probe to the other end of the line terminal. Hear the sound whether beep occurs or not, if beep occurs, continuity is in good otherwise fault may be in the line terminal. Repeat the step in the power cord, neutral and earth terminal.

Short circuit test: Place the multimeter red probe in line terminal and Multimeter black probe to the neutral terminal. If beep sound occurs, line and neutral terminal are in short circuit. Similarly carry the test with the earth terminal.

Step 2: Check Auto cut off accomplishing the thermostat. If it is not working in selected temperature value change the auto cut off switch to new one.



Step 3: Check the Thermostat with the series lamp test board.

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Condition:

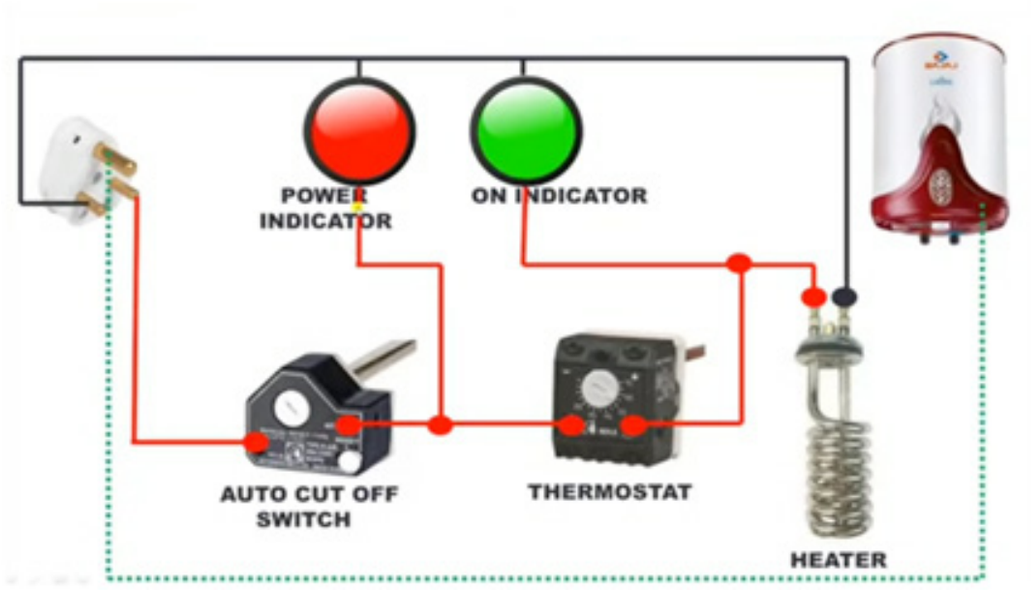
NC terminals always close – test lamp start glow else fault. Change the thermostat.

Step 4: Check the filament with the test board, if lamp glow then filament is ok or change the filament. Similarly check the filament terminal to the insulated cover of the filament. If the lamp glows, it indicates short circuit. Then change the filament with the new one.

Step 5: Ensure all the fault component are replaced with name plate of the geyser.

Task 3: Re assembling the geyser

Step 1: Assemble the geyser by reversing the process did in dismantling.



Step 2: Check the working condition by giving power source.

Result:

The dismantling, testing and reassembling were properly conducted. The appliance geyser is in good condition.

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EXPERIMENT

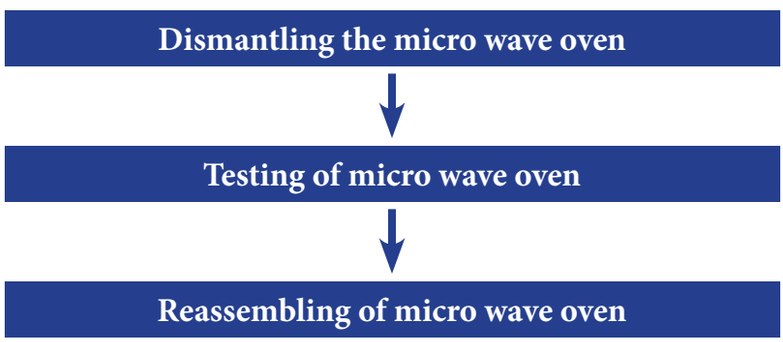
16

Microwave oven

Aim:

To know the method of dismantling, testing and reassembling of a micro wave oven.

Practical procedure:



Tools and materials required:

S.No	Name of the apparatus/component	Range/Value	Quantity
1	Insulated screw driver	300 mm	1no
2	Insulated long nose plier	150 mm	1 no
3	Micro wave oven	2000W	1 No.
4	Digital multi meter		1no
5	Soldering iron	50W	1no
6	Soldering paste		As required
7	Solder lead	60/40	As required

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Procedure:

Task 1: Dismantling the micro wave oven

Step 1: Remove the power cord of the microwave oven from the power supply.

Step 2: Unscrew the cabinet screw of the microwave oven.

Step 3: Identify the high voltage power capacitor without touching any of the components.

Step 4: Discharge the capacitor by using long insulated nose plier by shorting the terminals of high voltage capacitor.

Task 2: Testing of micro wave oven

Step 1: Ensure the high voltage capacitor is discharged.

Step 2: Test the power cord and electrical components of the micro wave oven with multi meter and know its continuity.

Step 3: Test the high voltage capacitor with the multi meter. If the capacitor is defective, replace it.

Step 4: With the help of multi meter or test lamp, test the continuity of heating element. If the heating element is not in good condition, replace it.

Step 5: Test the power transformer with multi meter and know its continuity. If any defects in coil side, replace it with a new one.

Step 6: Test the magnetron with the help of multi meter and know whether it is working or not. If it is not works, replace it to a new one.

Step 7: To know the earth leakage in magnetron, the multi meter leads are connected with magnetron and body. If the magnetron is under earth fault, then replace it with a new one.

Step 8: Test the continuity of the diode with multi meter and used accordingly.

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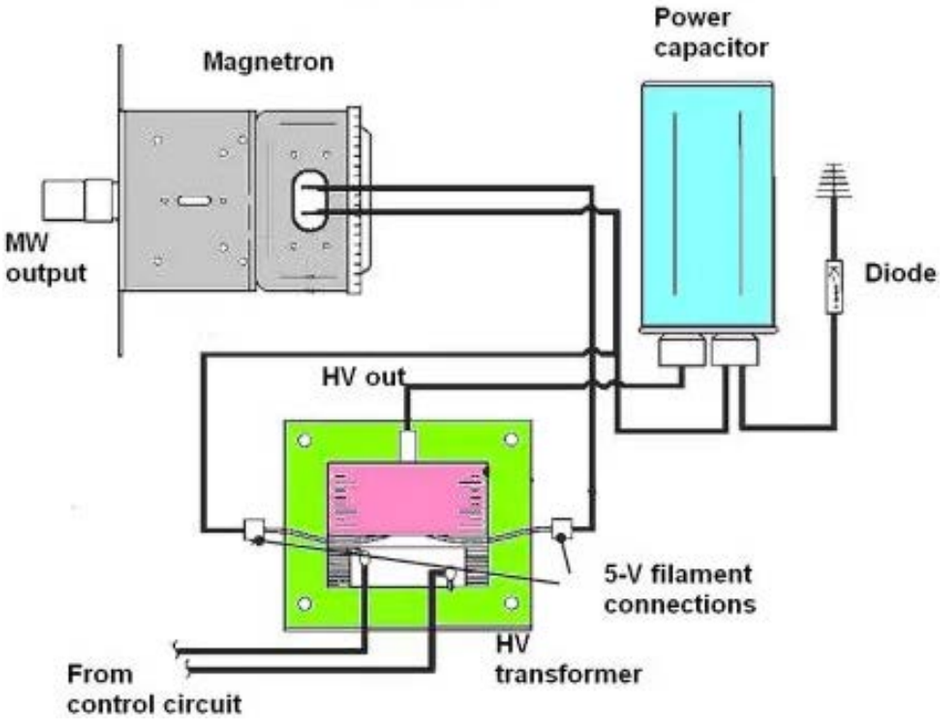
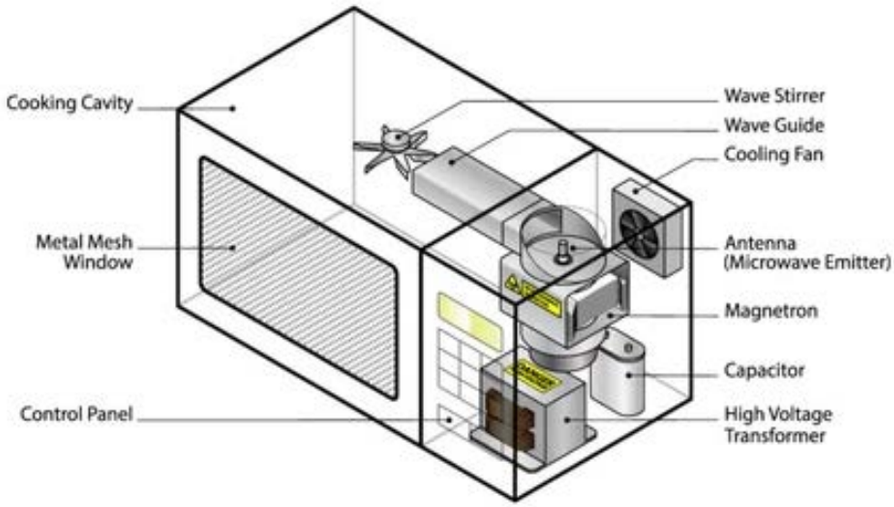
Task 3: Assemble the appliance of micro wave oven with a reverse process as did in dismantling.





Step 1: After testing of all the components reassemble it, and test the appliance with supply, It is working in good condition.

Result:

The dismantling, testing and reassembling of micro wave oven appliance was conducted practically and now the appliance is working with good condition.

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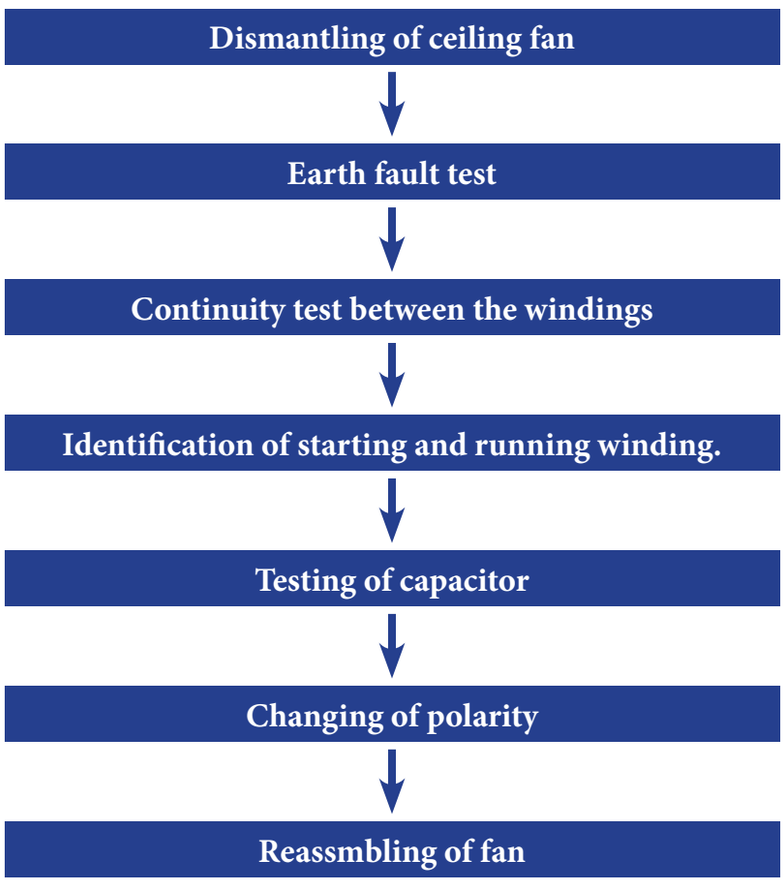
EXPERIMENT

17 Ceiling fan

Aim:

To know the method of dismantling, testing and reassembling of a ceiling fan.

Practical procedure:



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Tools and materials required:

S.No	Name of the Tools/Equipment	Range/Value	Quantity
1	Appliance test board	6A, 230V	1
2	Test lamp	60W, 230V	1
3	Combination plier	200 mm	1
4	Multi meter	(0 - 100V)	1
5	Ceiling fan	100 W, 230V	1
6	Screw driver	2 mm, 3 mm, 4 mm	Each 1
7	Spanner set	6 mm to 22 mm	1 set
8	Copper wire	1.5 Sq.mm.	As required
9	Insulation tape	-	1

Procedure:

Task 1: Dismantling the ceiling fan

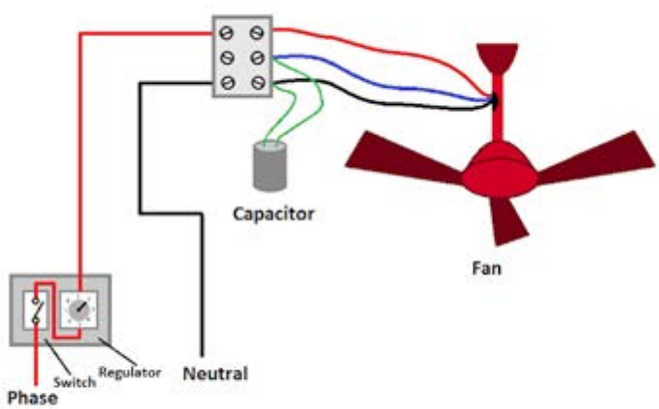
Step 1: Disconnect the power supply from the fan.

Step 2: Remove the fan from the ceiling.

Step 3: Keep the ceiling fan on the work bench.

Step 4: Remove the fan rod and blade from the body.

Step 5: Before removing the capacitor from the terminals, note (or) mark the points where the capacitor is connected.



Ceiling fan Wiring Diagram

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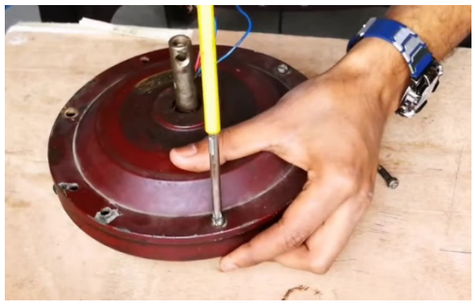
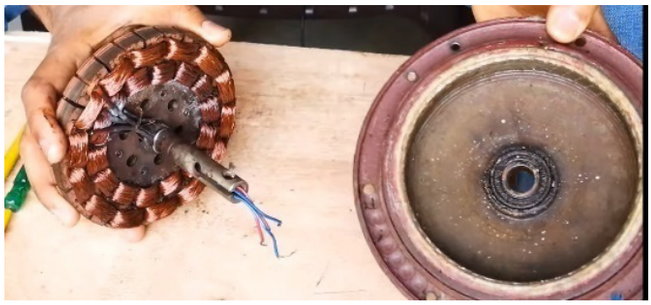
Task 2: Testing the earth fault

Step 1: Connect the test lamp between the each terminals (3) and the body of fan to know any insulation failure occurs as shown below.

Task 3: Checking continuity between the windings

Step 1: Remove the housing of the fan with appropriate tools.



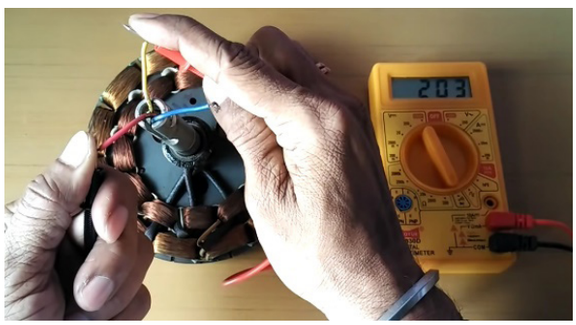


Step 2: Connect the test lamp between the terminals and check the continuity in the windings are correct.

Step 3: If the test lamp does not glow, it indicates that the windings are not in good and replace it with new winding.

Task 4: Identifying starting winding and running winding

Step 1: Connect the low value of resistance range in the multimeter using the selector switch.



Step 2: Note the readings in the below table and identify the starting and running winding.

S.No	Resistance in ohms	Starting or running winding
1		
2		

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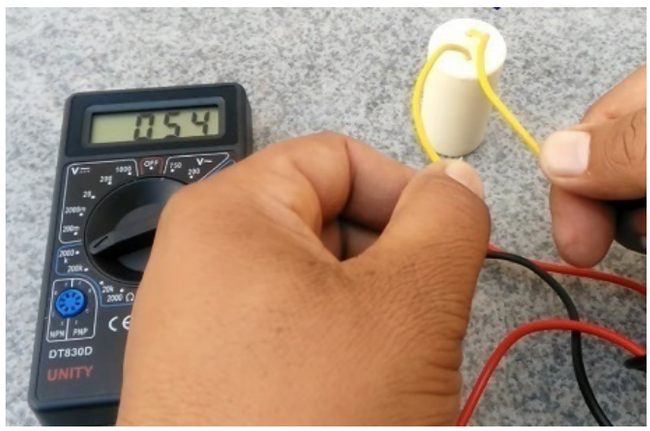
Note:

Low resistance and high resistance ensure running and starting winding respectively.

Task 5: Testing of capacitor.

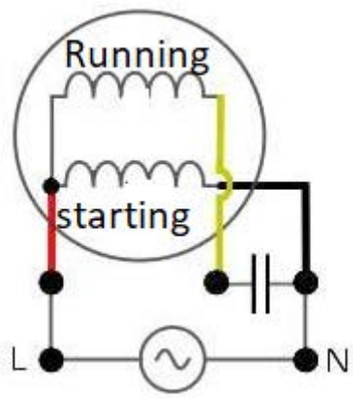


Step 1: The multi meter shows specific value of resistance on display it indicates the capacitor is good. If the value shows infinity, it indicates open circuit.

Step 2: If the values on the multi meter displays remains same with no change, then the capacitor is defective, and replace another.

Task 6: changing of polarity

Step 1: To reverse the direction in ceiling fan, remove the capacitor from starting winding and reconnect in series with the running winding as shown below.



Task 7: Assembling the fan

Step 1: Connect the capacitor back to its original position. i.e. series with starting winding.

Step 2: Close the housing and tighter the screw.

Step 3: Now hold the rotor, and rotate the stator with free hand and ensure the fan rotates with no noise and vibration. Else replace the bearings.

Step 4: Connect the power supply to the fan, check its working before mounting on ceiling.

Result:

The ceiling fan was dismantled, conducted various tests and finally reassembled. Now the ceiling fan is running in good condition.

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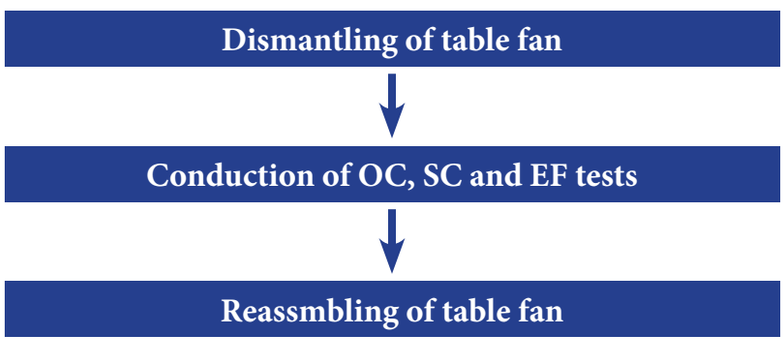
EXPERIMENT

18 Table Fan

Aim:

To know the method of dismantling, testing and reassembling of a table fan.

Practical procedure:



Tools and materials required:

S.No	Name of the apparatus/ components	Range/Value	Quantity
1	Table fan	230V, 60W	1
2	Combinational plier	150 mm	1
3	Screw driver	150 mm	1
4	Test lamp	230V, 100W	1
5	Multi meter	Digital	1
6	Connecting wires		As required
7	Grease		1 pocket
8	Waste cloth		As required

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Procedure:

Task 1: Dismantling of a table fan

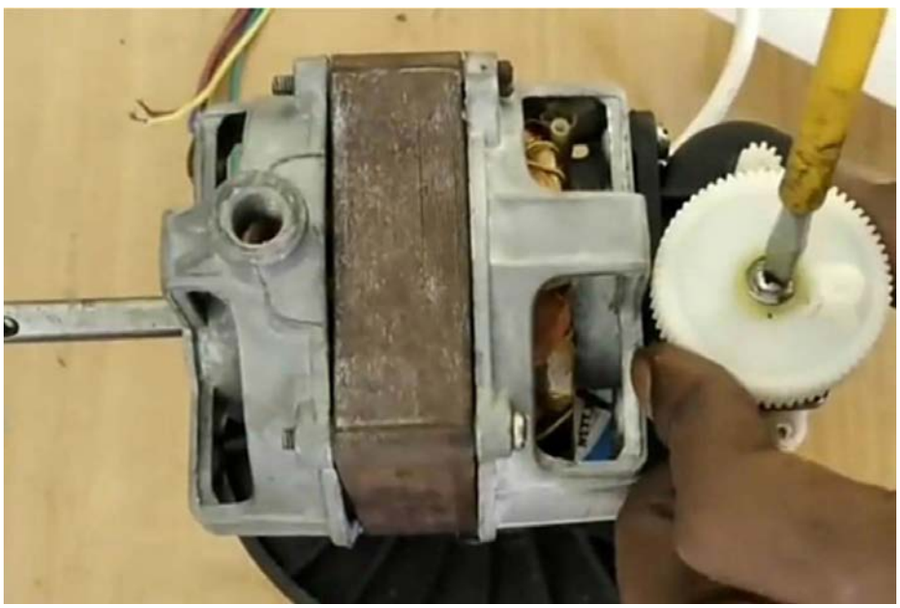
Step 1: Keep the table fan in smoothed surface area.

Step 2: Open the clips of the front cage and keep separately.

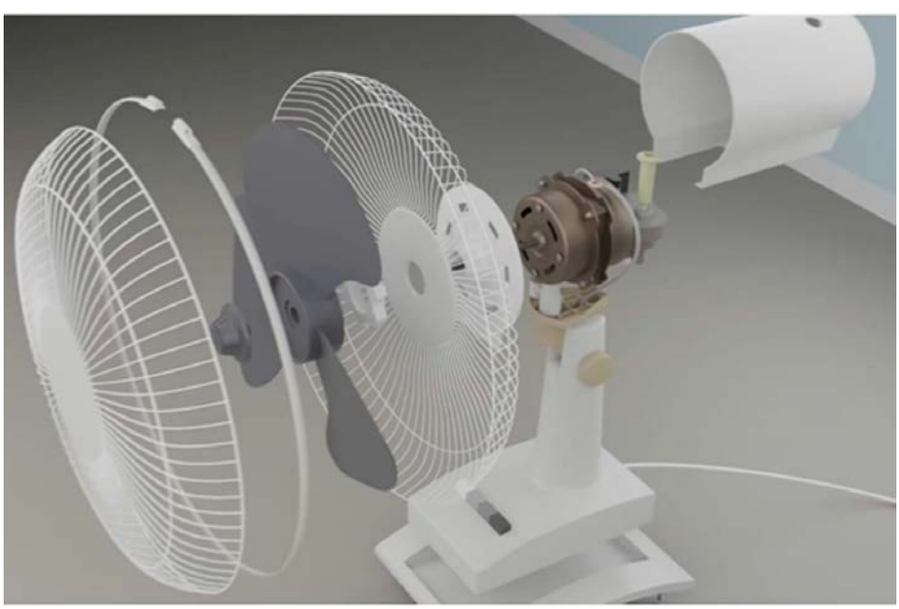
Step 3: Remove the screws in the blades by using screw driver, and separate it from the shaft.

Step 4: Unscrew the back cover and remove it.

Step 5: Take out the gear box by removing the mounted screws.



Step 6: Finally remove the rotor with combinational plier and keep separately.



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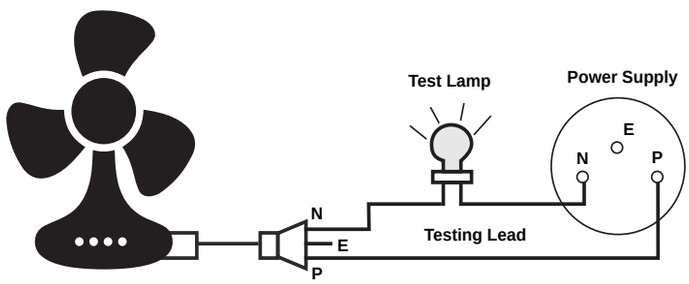
Task 2: Identification of parts of a table fan

1. Front cage
2. Regulator/ON-OFF switch
3. Back cage
4. Blades
5. Power cord
6. Gear box (Oscillating mechanism)
7. Motor

Task 3: Testing of a table fan

Open circuit and Short circuit test

Step 1: Connect the testing procedure as per diagram. When the supply is ON, if the lamp glows with dim brightness, it represents the table fan is in good condition. If the lamp glows with the specified watts, then it indicates short circuit. If the lamp does not glow, it indicates the open circuit.



Earth fault Test

Step 1: In test lamp method, connect one terminal with supply and another terminal with the body of the table fan. If the test lamp glows, it indicates the table fan is under earth fault.

Capacitor Test

1. By using 230V AC supply

Step 1: Make sure that the capacitor is fully discharged.

Step 2: Short the two ends of the capacitor to discharge (or) short it with the help of a screw driver.

Step 3: Connect the capacitor terminals with AC supply for few seconds to make it charge and disconnect it from the supply.

Step 4: Following safety precautions, make the terminals to get short circuited.

Step 5: If it gets strong spark, it indicates the capacitor is in good condition. If the spark is weak (or) gets no spark, it indicates that the capacitor is defaulted and new capacitor has to be replaced.

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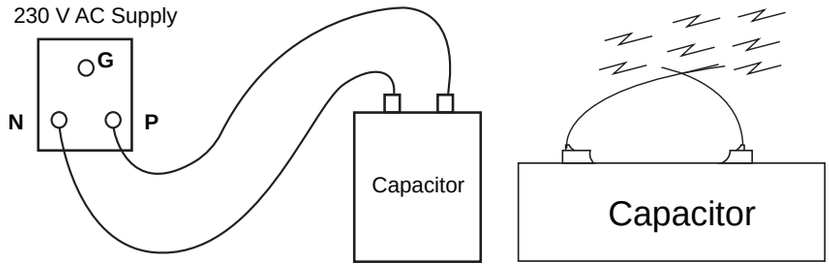
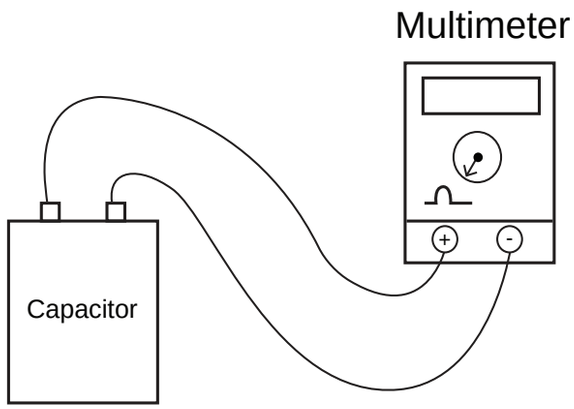


2. By using multi meter

Step 1: Make sure that the capacitor is fully discharged.

Step 2: Short the two ends of the capacitor to discharge (or) short it with the help of a screw driver.

Step 3: Connect the multi-meter leads with the capacitor terminals.



Step 4: Keep the multi meter knob in high resistive value.

Step 5: If the value of multi-meter increases from zero towards high, it indicates that the capacitor is charging and in good condition.

Step 6: If the value of the multimeter will decreases and reach towards zero, It indicates that the capacitor is discharging, and have to replace new one.

Task 5: Reassembling of table fan

Step 1: After completing the tests of table fan, assembling has to be done. For this we have to follow the reverse process as what was done during dismantling the table fan.

Step 2: Fix the gear box on the motor and tight the screws by using screw driver.

Step 3: Fix the back cover of the table fan and screw it.

Step 4: Then fix the blades and then tight the screws.

Step 5: Finally, fix the front cage of the table fan and close it with clips.

Result

The given table fan was practically dismantled, its parts were identified and tested and finally it was reassembled. Now the table fan is running with good condition.

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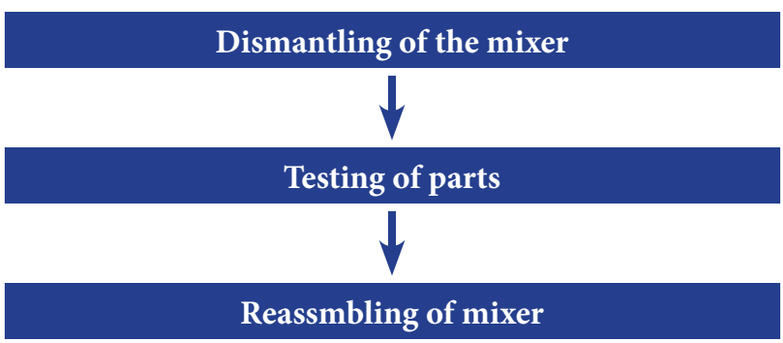
19 Mixer/Juicer

Aim:

To know the method of dismantling, testing and reassembling Mixer/Juicer.

Operations to be covered under this experiment:



List of tools and equipments:

S.No	Name of the Tools/Equipment	Range/Value	Quantity
1	Appliance test board	6A, 230V	1
2	Test lamp	230V	1
3	Combination plier	200 mm	1
4	Multi-meter	AC/DC	1
5	Mixer	230V, 750W	1
6	Screw driver	3 mm, 4 mm	Each 1
7	Wire stripper	150 mm	1
8	PVC copper wire	2 Sq mm	As required
9	Insulation tape	-	1

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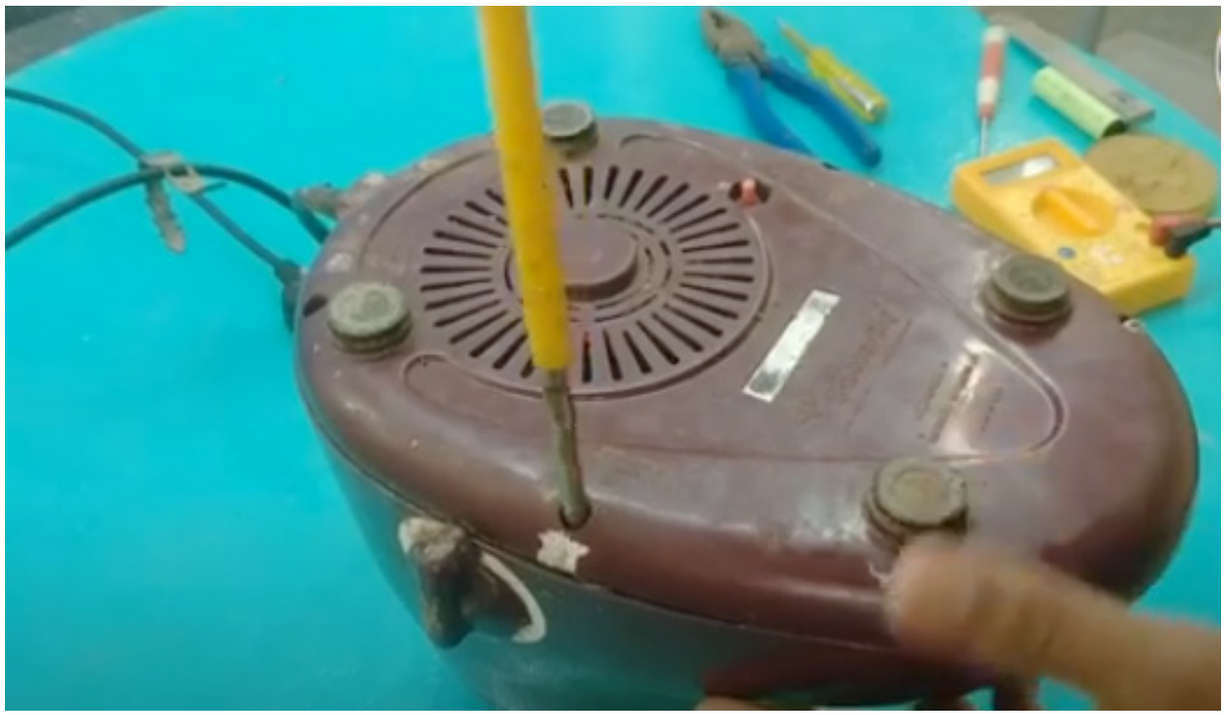
Procedure:

Task 1: Dismantling method of Mixer

Step 1: Remove the power supply from the mixer.

Step 2: Invert the mixer to down position.

Step 3: Unscrew the housing from the bottom as shown below.



Step 4: Unplug the wires from the overload switch and speed regulator.

Task 2: Testing the power cord

Step 1: Remove the power cord from the mixer. Visually, If any damage can be seen replace it.

Step 2: Test the continuity of the power cord with multi meter and ensures it is good.

Step 3: Test lamp can also be used for knowing the continuity of power cord.

Task 3: Testing of the over load switch

Step 1: Remove the overload switch from the housing.

Step 2: Check the working of overload switch by pressing the reset knob

Step 3: Connect the test lamp between the two terminals of overload switch as shown below.

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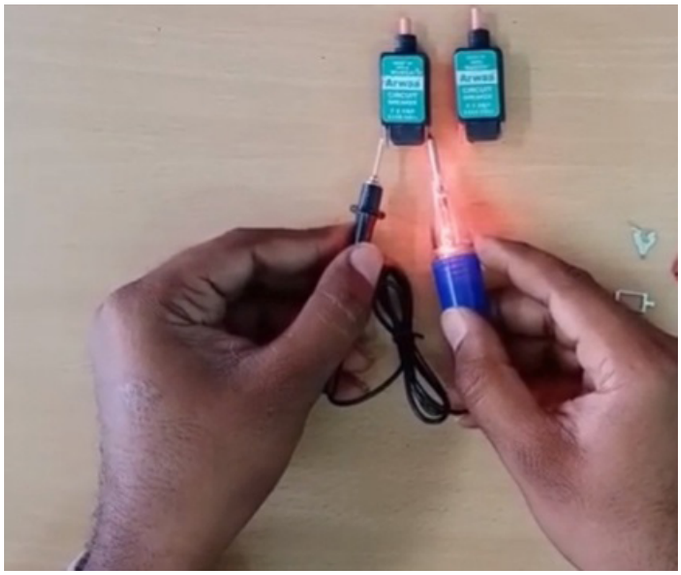


Step 4: If lamp does not glow, switch is defective. Replace the switch with a new one.

Task 4: Testing of the speed regulator

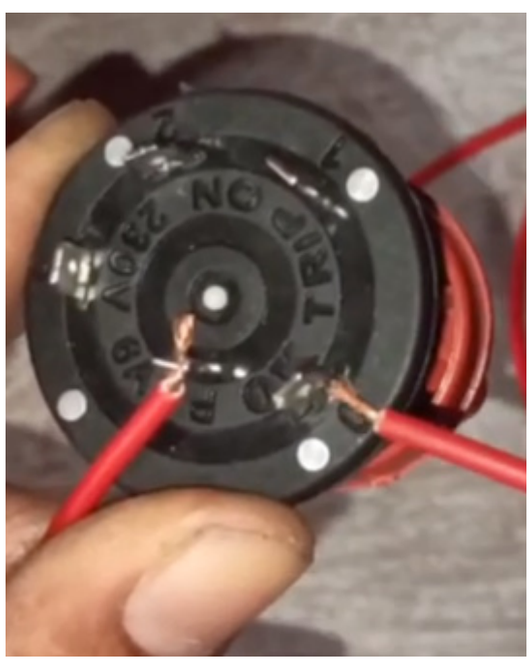
Step 1: Fix the multi meter in continuity mode.

Step 2: Set the knob in zero position in the speed regulator.

Step 3: Check the continuity by selecting Point 1, 2, 3 in the rotary switch.

Step 4: If there is no continuity, replace the switch with new one.

Step 5: Use the test lamp between the point 'p' and other terminals 0, 1, 2 and 3 in rotary switch.



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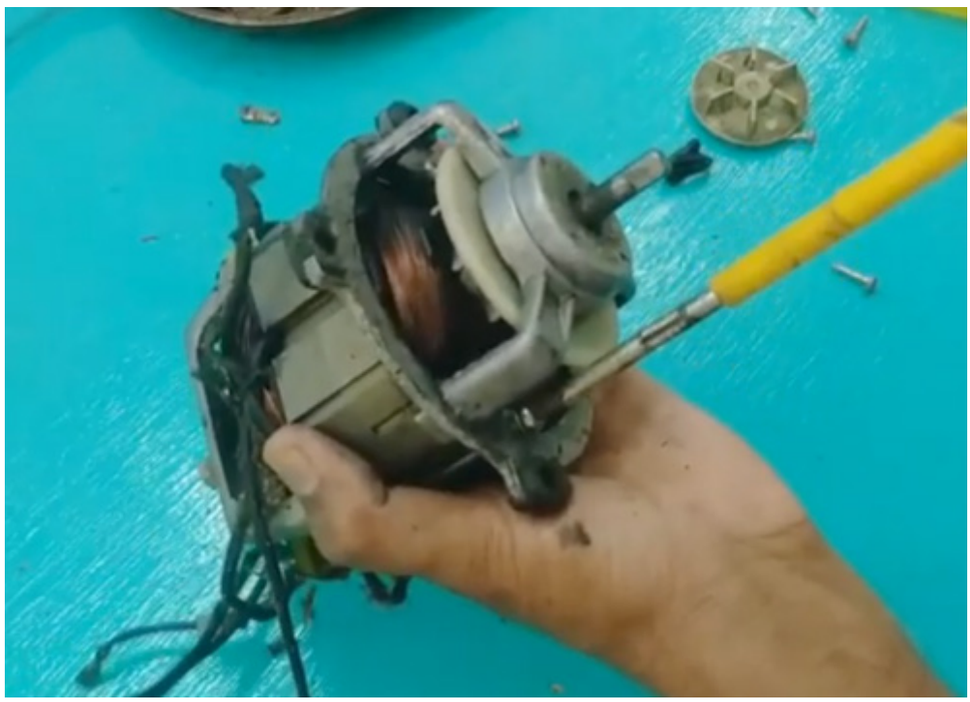
Caution:

Most care is needed while checking the continuity in rotor winding by using test lamp.

Task 5: Dismantling the motor

Step 1: Remove the motor from the housing.



Step 2: Dismantle the motor parts as shown below.

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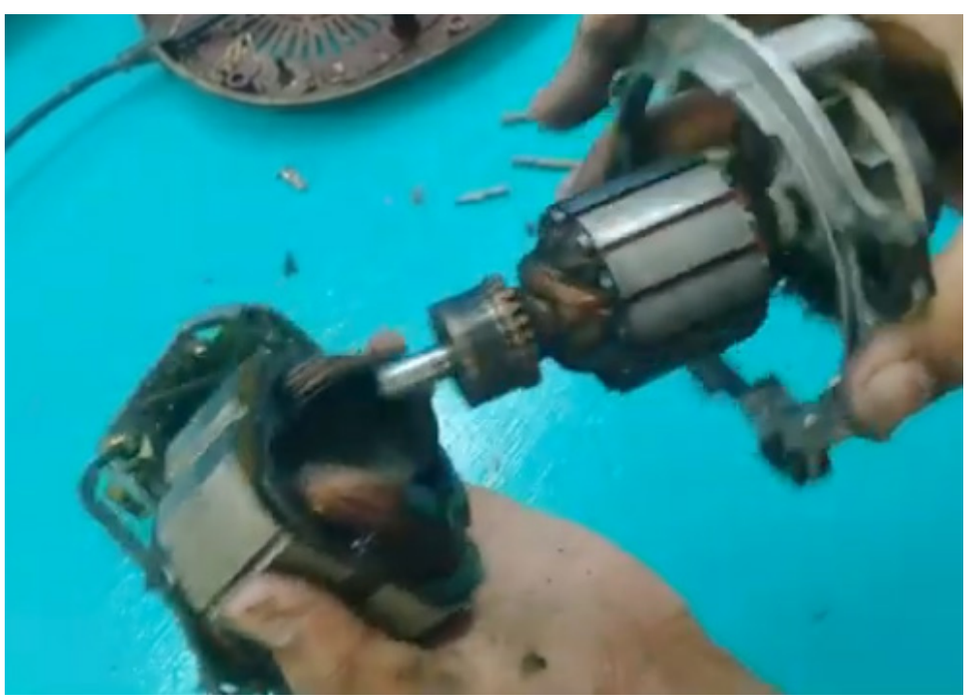
Step 3: Remove the carbon brushes from the housing, check visually, If any depreciation occurs, replace with good one.

Note: Depreciation in the carbon brush can lead to occur sparking at commutator & motor may stop.

Step 4: Separate the stator from rotor.



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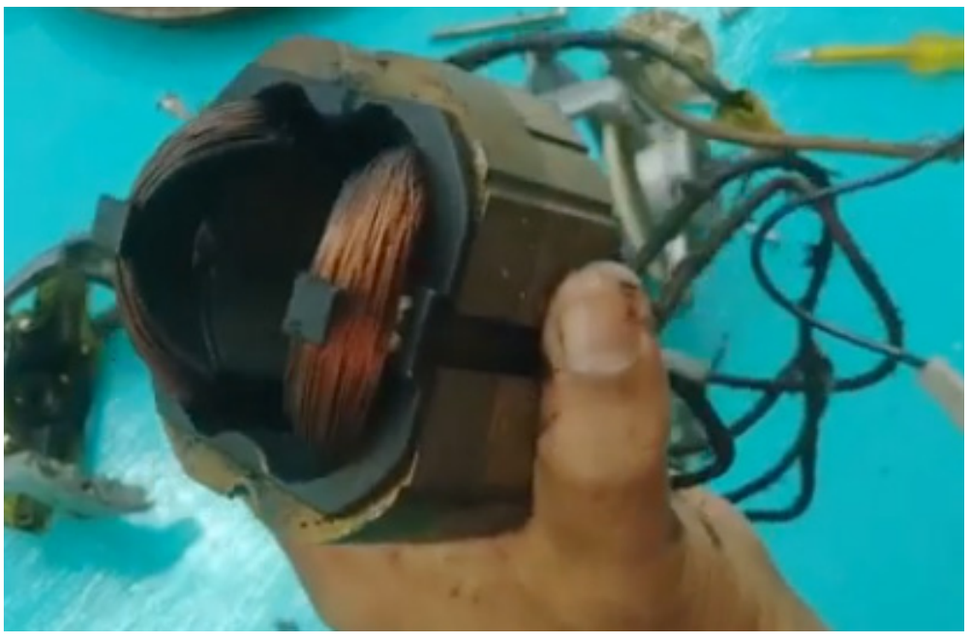
Step 5: Check the continuity in the stator winding using the multi-meter between the tapping as shown below.



Step 6: Check the continuity in the rotor winding using multi-meter by placing one end of the probe on the commutator segment & other probe on the slots one by one as shown below.

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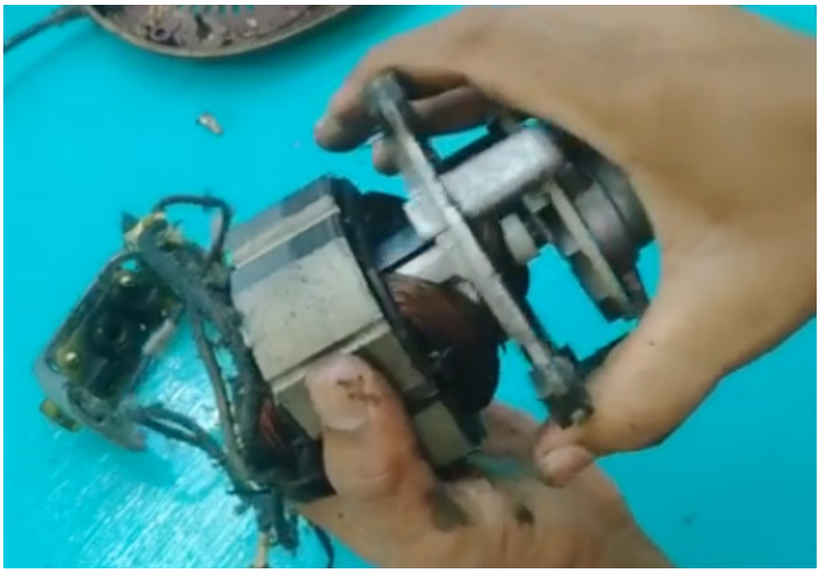
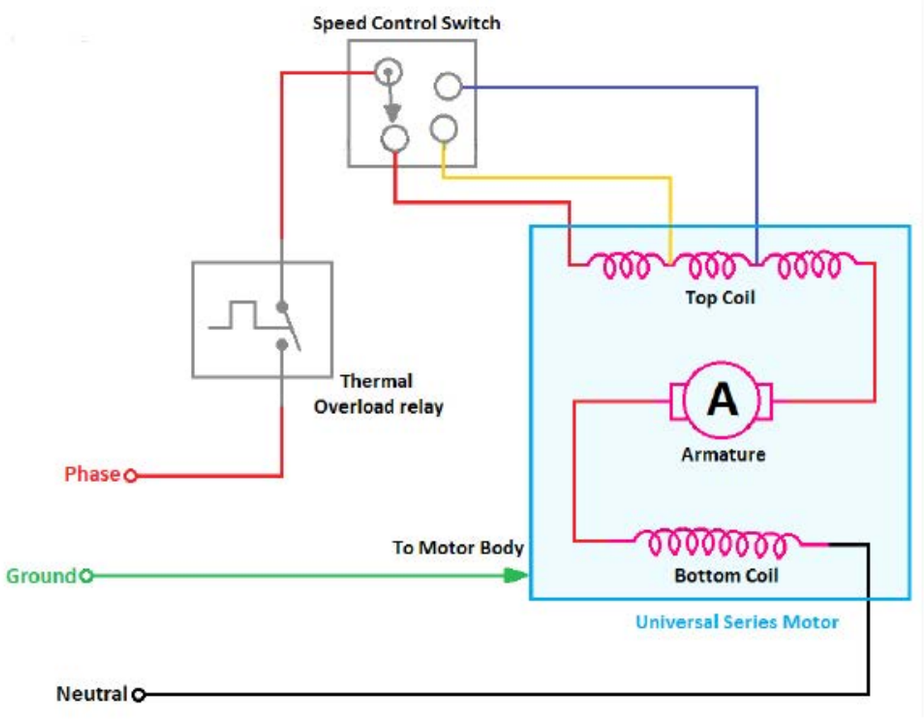
Task 6: Reassembling the parts

Step 1: Reassemble the stator, rotor & carbon brush to its position.

Step 2: Mount the motor on the housing.



Step 3: Connections are made as per the diagram



Step 4: Connect the power supply to the mixer & check for its working

Result:

The mixer is dismantled, tested and reassembled with proper way and it is in good condition.

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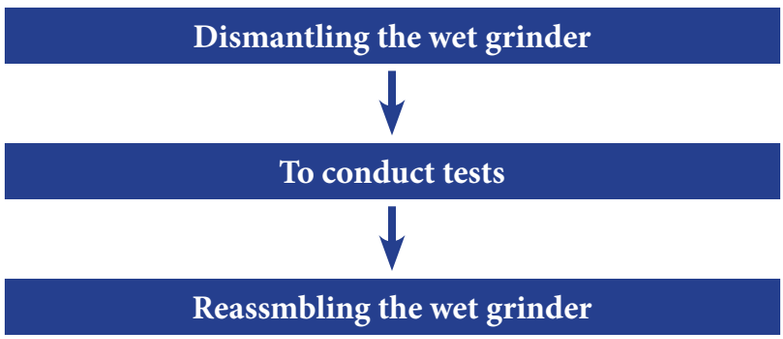
EXPERIMENT

20 Wet Grinder

Aim:

To know the method of dismantling, testing and reassembling of wet grinder.

Practical procedure:



Tools and materials required:

S.No	Name of the Tools/Equipment	Range/Value	Quantity
1	Appliance test board	6A, 230V	1
2	Test lamp	60W, 230V	1
3	Wet grinder	230V, 0.5 HP	
4	Combination plier	200 mm	1
5	Screw driver	3 mm, 4 mm	Each 1
6	Wire stripper	150 mm	1
7	Spanner set	6 – 24 mm	1 set
8	Copper wire	1.5 Sq.mm.	As required
9	Insulation tape	-	1

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Procedure:

Task 1: Dismantling the wet grinder

Step 1: Disconnect the plug and stop the supply of the wet grinder.

Step 2: Remove the housing of the wet grinder with appropriate tools.

Task 2: Check the belt and wheel

Step 1: Check whether the belt is having enough tension to drive motor as shown below. If not, replace the belt and fit it thghtly.

Step 2: Rotate the wheel by free hand and ensure that the wheel rotates without any sound or vibration. If anything occurs, replace the bearing.

Task 3: Testing of power cord and a capacitor

Step 1: Remove the motor from the housing by using appropriate tools.

Step 2: Disconnect the power cord from the motor terminal and check the continuity of the power cord. While testing the power cord in multi meter, if it shows continuity, it indicates power cord is good. If there is no continuity, then replace the power cord.

Step 3: Similarly test the power cord for short circuit between the wires by placing the multimeter leads between each terminal in 3 pin top. If any continuity occurs, it concludes that the power cords is under short circuit, and have to replace it.

Step 4: Disconnect the capacitor from the motor and test it by using multimeter.

Step 5: Set the multimeter rating in ohms by using selector switch.

Step 6: Connect the multimeter leads across the lead of the capacitor. If the multimeter shows a value of resistance on display, and soon it will move to high value of resistance. Now we can say that the capacitor is in good condition.

Step 7: If the values of the multimeter remains same with no change, then the capacitor is defective and have to replace it.

Task 4: Identifying and testing of motor windings

Step 1: Now you could see four terminals on the motor.

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Step 2: Place the test lamp on four terminals between each other and identify the 2 set of winding and also the continuity between the windings.

Step 3: If there is no continuity, then the windings are defective and have to replace it.

Step 4: To identify the starting and running winding, set the multimeter in low value of resistance range using selector switch.

Step 5: Place the multimeter probes between the set of windings and note down the resistance value in the given table.

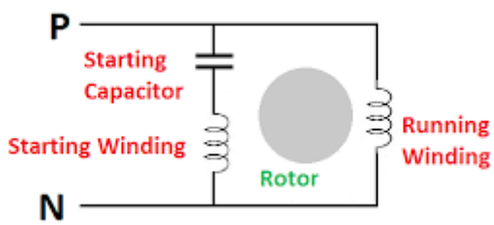
S.No	Resistance (Ohms)	Starting/Running winding
1		
2		

Note:

Low resistance and high resistance ensure running and starting winding.

Task 5: Assembling of the wet grinder

Step1: Connect the capacitor in series with the starting winding. i.e. high resistance winding as shown below.



Step 2: Connect the power cord and mount the motor on the housing.

Step 3: Connect the belt between the pulley and wheel.

Step 4: Connect the power supply to the wet grinder and verify its working.

Result:

The dismantling, testing and reassembling method of wet-grinder was practically done. Now the wet grinder is working in good condition.

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