Rajiv Gandhi University of Knowledge Technologies



Manufacturing Process Lab Manual

DEPARTMENT OF MECHANICAL ENGINERING

INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGIES

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S.NO	NAME OF THE EXPERIMENT
1.	PREPARATION OF A MOULD CAVITY USING SINGLE PIECE PATTERN
2.	PREPARATION OF A MOULD CAVITY SPLIT PIECEPATTERN
3.	PREPARATION OF A BUTT JOINT BY USING MANUAL METAL ARC WELDING PROCESS
4.	PREPARATION OF A LAP JOINT BY USING MANUAL METAL ARC WELDING PROCESS
5.	FILL THE HOLES IN A GIVEN METAL WORKPIECE WITH FILLER METAL BY USING OXY - ACETYLENE GAS WELDING
6.	PREPARATION OF A “V” SHAPE FIT USING FITTING OPERATION
7.	PREPARATION OF A “L” SHAPE FIT USING FITTING OPERATION
8.	HOUSE WIRING INCLUDING WITH SERIES, PARALLEL AND STAIR CASE CONNECTION
9.	STAIRCASE WIRING CONNECTION
10.	GO DOWN WIRING CONNECTION

FOUNDRY

Exp No: 1

SINGLE PIECE SOLID PATTERN

AIM:

To prepare sand mold cavity with single piece rectangular pattern by using sand molding.

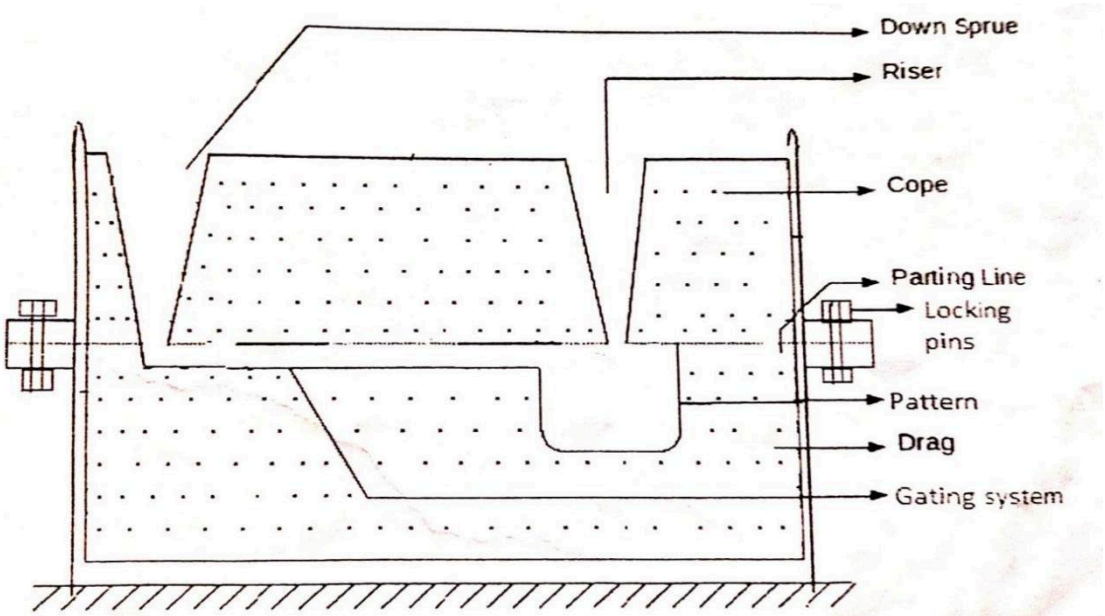
Tools Required:

Cope box, Drag box, Runner, Sprue pin, Riser, Gate cutter, Trowel, Vent rod, Slick. Pattern, Round rammer, Side rammer, wooden mallet, Crucible, Furnace, Tongs

Material used:

Green sand (95-97% silica sand, 2-3% Binder (Bentonite),2-3% Water), Backing sand, parting sand.

Job Diagram:



Casting (Single Piece Pattern)

Procedure:

1. Prepare green sand mix with required proportions (fine silica sand: 95-97%, binder (bentonite): 2-3% and water: 2-3%).

2. Take a drag box placed either on the molding platform or on the floor which should be free from dirt or external particles.

3. Place pattern in the center of the drag box and fill the drag box with the green sand. Ram it tightly with the help of wooden mallet and make sure that whenever doing ramming, Process pattern positions should not be disturbed.

4. Once the drag box is packed with green sand up to its surface level, drag it with strike of edge across its surface in order to remove excess material and create a flat surface.

5. Reverse drag box so that pattern face of the drag box can be visible.

6.Sprinkle parting sand on the surface of entire drag box to avoid cohesive nature between the sand particle of drag and cope. Tale, chalk dust and graphite can be used for this purpose.

7.Place cope on the top of the drag box. The alignment of cope and drag box should be done with the help of locking pins.

8. Align counter part of the split pattern on the first half along with runner and rise attachment in the cope box before filling green sand.

9.Fill the cope box with green sand and ram it carefully with the help of wooden mallet and make sure that whenever doing ramming process. Runner and riser attachment should not be disturbed.

10. Remove runner, riser and cope box, remove patterns from the drag box with help of draw spike without disturbing mold cavity.

11. Create gating system with help of gate cutter which source will be located right at the edge of the pattern.

12. on the cast product and send it for further machining operations to get the required dimensions.

13. Make a provision of air vents to escape hot gases. Use vent rod to create air vents around the pattern by pushing the rod all the way down free thickness of the cope box.

14. Melt different metals in a furnace. Pour molten metal into the mold cavity. Let it cool down until the metal gets solidified. Open the flask, remove sand particle and remove the cast product.

Precautions:

1. There should be enough clearance between the pattern and the walls of the flask.

2. The ramming of the sand should be done properly so as not to compact it too hard. Which makes the escape of gases difficult.

Result:

Finally prepared the mound cavity by using single piece solid pattern.

Viva-Voce Questions:

1. What is the difference between pattern and casting?

2. Name the different tools used in hand molding and stating their use?

3. What are the main constituents of molding sand?

Exp No: 2

SPLIT PIECE PATTERN

Aim:

To prepare sand mold cavity with split pattern by using sand molding.

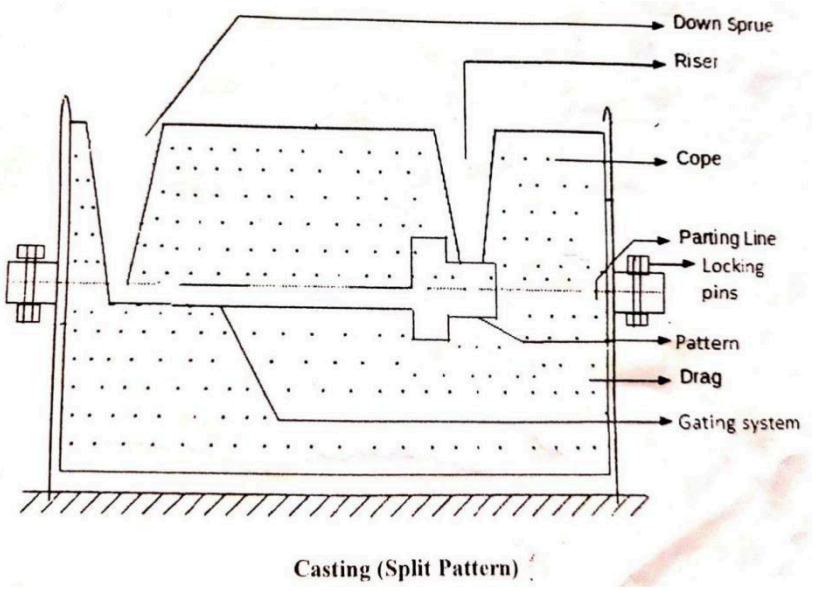
Tools Required:

Cope box, Drag box, Runner, Sprue pin, Riser, Gate cutter, Trowel, Vent rod, Slick. Pattern, Round rammer, Side rammer, wooden mallet, Crucible, Furnace, Tongs

Material used:

Green sand (95-97% silica sand, 2-3% Binder (Bentonite),2-3% Water), Backing sand, parting sand.

Job Diagram:



Casting (Split Pattern)

Procedure:

1. Prepare green sand mix with required proportions (fine silica sand: 95-97%, binder (bentonite): 2-3% and water: 2-3%).

2. Take a drag box placed either on the molding platform or on the floor which should be free from dirt or external particles.

3. Place first half part of split pattern in the center of the drag box and fill the drag box with the green sand. Ram it tightly with the help of wooden mallet and make sure that whenever doing ramming, Process pattern positions should not be disturbed.

4. Once the drag box is packed with green sand up to its surface level, drag it with strike of edge across its surface in order to remove excess material and create a flat surface.

5. Reverse drag box so that pattern face of the drag box can be visible.

6. Sprinkle parting sand on the surface of entire drag box to avoid cohesive nature between the sand particle of drag and cope. Tale, chalk dust and graphite can be used for this purpose.

7. Place cope on the top of the drag box. The alignment of cope and drag box should be done with the help of locking pins.

8. Align counter part of the split pattern on the first half along with runner and rise attachment in the cope box before filling green sand.

9. Fill the cope box with green sand and ram it carefully with the help of wooden mallet and make sure that whenever doing ramming process. Runner and riser attachment should not be disturbed.

10. Remove runner, riser and cope box, remove patterns from the drag box with help of draw spike without disturbing mold cavity.

11. Create gating system with help of gate cutter which source will be located right at the edge of the pattern.

12. Make a provision of air vents to escape hot gases. Use vent rod to create air vents around the pattern by pushing the rod all the way down free thickness of the cope box.

13. Melt different metals in a furnace. Pour molten metal into the mold cavity. Let it cool down until the metal gets solidified. Open the flask and remove the cast product.

14. Remove sand particle on the cast product and send it for further machining operations to get the required dimensions.

Observations:

1. After ramming using mold hardness tester check the mold hardness on all the four sides of the pattern.

2. Locate the runner and riser 90^0 exactly.

Precautions:

1. Ramming should be uniform to impart uniform strength to the mold.

2. Apply parting sand at the partitions for easy separations of boxes.

3. Locate the two halves of pattern properly to avoid mismatch.

Result:

Finally prepared the mold cavity by using split pattern.

Viva- Voce Questions:

1. What is the best shape of a riser, and why?

2. What is core?

3. What is the necessity of providing vent holes on mold?

4._____ furnace is used for melting metals?

WELDING

Exp No: 3

BUTT JOINT

Aim:

To prepare a butt joint operation on a given metal work piece by using manual metal are welding.

Tools Required:

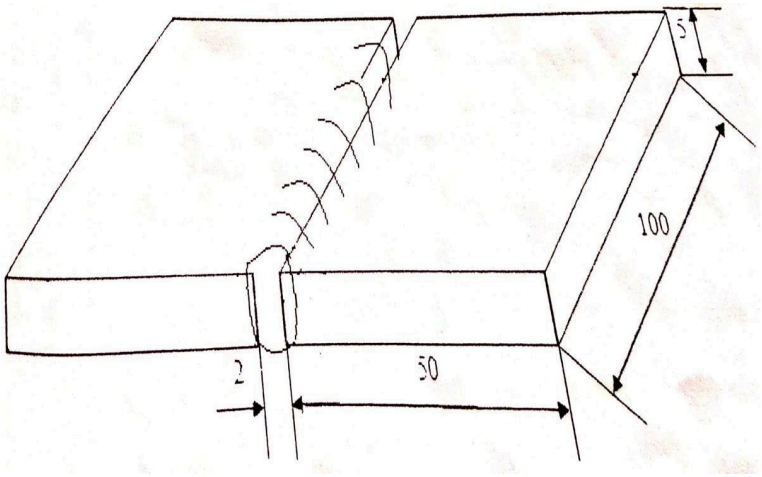
Steel rule, chipping hammer, face shield, Wire brush, Gloves, Tongs, are welding machine

Material Required:

Work piece - MS flat plate of 50 X 100 X 5 mm^3

Welding electrode - MS rod with $Caco_3$ flux coating

Job Diagram:



All dimensions are in millimeters

Procedure:

1. Cut the two pieces to the given dimensions and remove if any oxide layer formed on the work piece using emery paper

2. Hold the electrode with electrode holder & choose the terminals for both the electrode and work piece in the following manner.
(a) Straight polarity:
Electrode - Negative
Work piece -Positive
(b)Reverse polarity:
Electrode - Positive
Work piece -Negative

3.Keep the work pieces side by side (butting) for butt joint.

4.Maintain the gap between the work pieces & electrode is equal to the diameter of electrode.

1. Perform the welding operation over the entire length with uniform speed.

2. Remove the slag with chipping hammer and clean with brush if any particles present on the work piece.

Precautions:

1. Wear apron, shoes, gloves, face shield, goggles and tight fitted clothes.

2. Be careful and attentive while on the welding job.

3. During welding, do not see the welding light directly without the goggles / face shield.

4. No inflammable material should be present in welding shop.

5. Do not hold the work piece after completing the welding operation. Use tongs for holding work piece.

Result:

Finally prepared a butt joint on a given metal work piece by using manual metal arc welding.

Viva- Voce Questions:

1. What is the advantage of having different polarities?
2. What are the electrodes used in are welding?
3. What is electrode coating and why are they provide?
4. What is the difference between soldering and brazing?

Exp No: 4

LAP JOINT

Aim:

To prepare a lap joint for the given two metal work pieces by using manual metal are welding.

Tools Required:

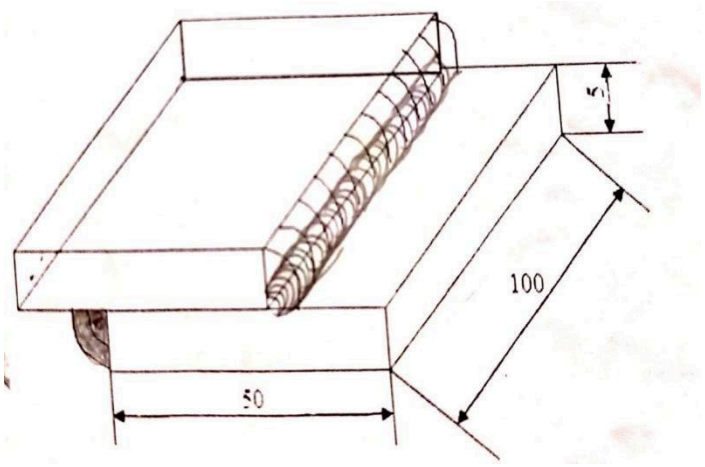
Steel rule, chipping hammer, face shield, Wire brush, Gloves, Tongs, Arc welding machine

Material Required:

Work piece -MS flat plate of 50 X 100 X 5 mm^3

Welding rod -MS rod with $Caco_3$ flux coating

Job Diagram:



All dimensions are in millimeters

Procedure:

1. Cut the two pieces to the given dimensions and remove if any oxide layer formed on the work piece using emery paper.

2. Hold the electrode with electrode holder & choose the terminals for both the electrode and work piece in the following manner.

(a) Straight polarity:
Electrode - Negative
Work piece -Positive

(b) Reverse polarity:
Electrode - Positive
Work piece -Negative

3. Keep the work pieces one over another (overlap) for lap joint.

4. Maintain the gap between the work pieces & electrode is equal to the diameter of filler rod.

5. Perform the welding operation over the entire length with uniform speed.

6. Remove the slag with chipping hammer and clean with brush if any particles present on the work piece.

Precautions:

1. Wear apron, shoes, gloves, face shield, goggles and tight fitted clothes.

2. Be careful and attentive while on the welding job.

3. During welding, do not see the welding light directly without the goggles / face shield.

4. No inflammable material should be present in welding shop.

5. Do not hold the work piece after completing the welding operation. Use tongs for holding work piece.

Result:

Finally prepared a lap joint on a given metal work piece by using manual metal arc welding.

Viva - Voce Questions:

1. What do you understand by the term polarity? What type polarity you used while performing Experiment?

2. What is flux?

3. How is an electrode specified? What factors govern the selection of an electrode?

4. Compare A.C. power source welding with D.C. power source welding?

Exp No: 5

OXY-ACETYLENE GAS WELDING

Aim:

To fill the holes in a given metal work piece with filler metal by using oxy-acetylene gas welding.

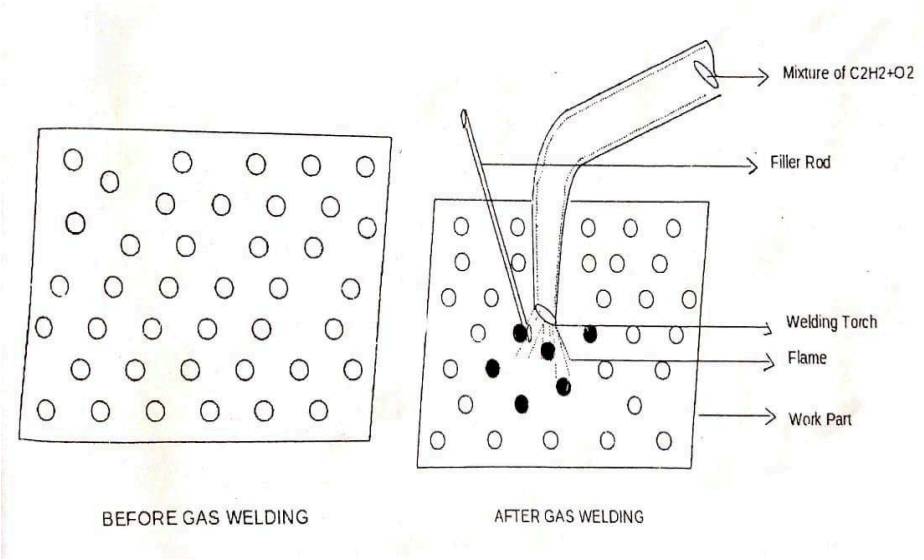
Tools Required:

Oxygen, acetylene cylinders, G.I filler rod, Hoses, Goggles, Pressure regulation.

Material Used:

Work piece - MS flat plate of 1.5 mm thickness

Job Diagram:



Procedure:

1. Prepare the work piece to be welded and place them in proper position on the welding table.

2. Select proper tip size for the job and fix it to the torch.

3. Select the filler rod of recommended size.

4. Adjust the torch for neutral flame.

5. Place the filler rod in the hole and take the flame nearer to the hole.

6. Do this process continuously up to fill the hole by using filler rod.

Precautions:

1. Wear goggles, gloves while performing operation.

2. Always use the spark lights to light the torch Don’t use match.

3. Strictly follows the procedures laid out in handling the cylinders, regulators and the torches.

4. Never play or gets care less while using the gas welding equipment because combustible gas must be handled carefully.

Result:

The metal work part is filled with the filler rod by using oxy acetylene gas welding.

Viva - Voce Questions:

1. What is a gas welding rod?

2. Give the complete procedure of gas welding.

3. Compare high pressure and low-pressure gas welding

4. Sketch an oxygen cylinder. How does it differ from acetylene cylinder?

5. How will you generate and store acetylene gas?

FITTING

Exp No: 6

V- SHAPE FIT

Aim:

To make a V shape fit on a given metal work piece by using fitting operation.

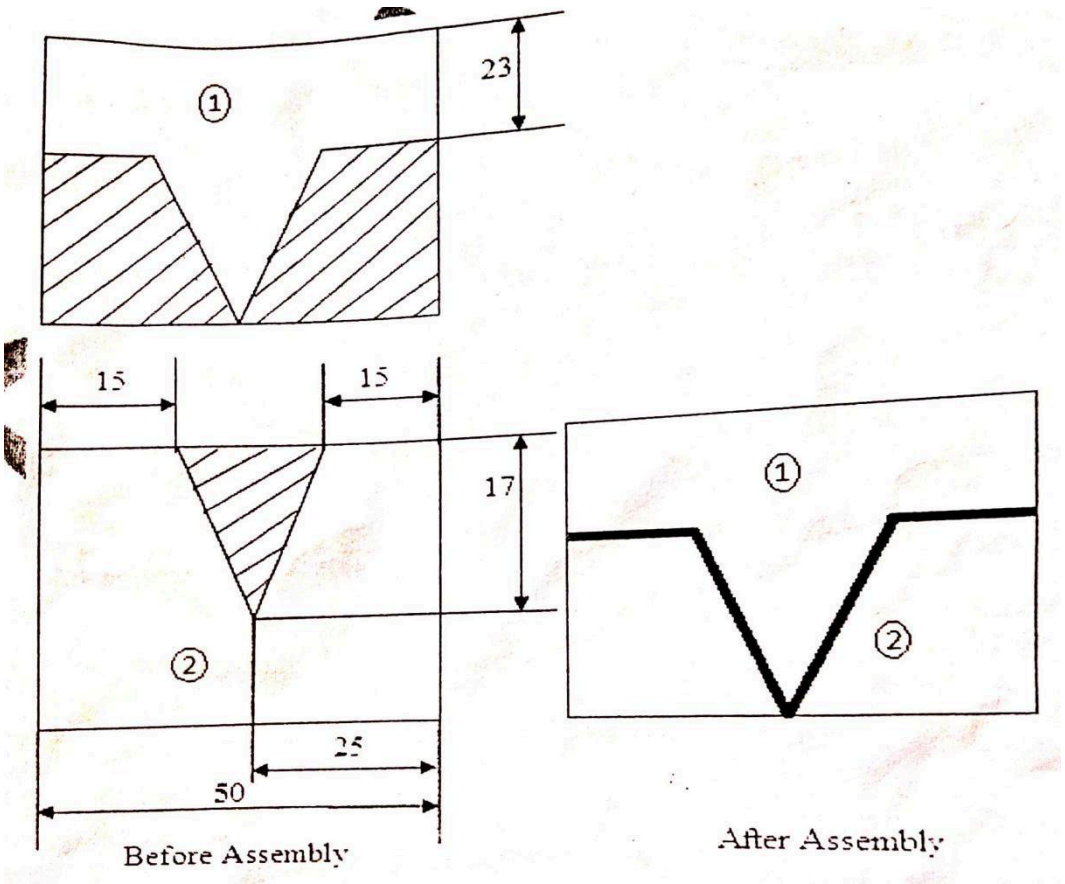
Tools Required:

Bench vice, Steel rule, Flat file, square file, Dot punch, Scriber, Hack saw blade with frame, Tri square, Ball peen hammer.

Material Used:

Work piece - Mild Steel flat plate of 50 X 40 X 5 mm^3

Job Diagram:



Procedure:

1. Cut a pair of flat pieces of required dimension using power hacksaw machine.

2. Check both edges for squareness using Tri - square.

3. Apply the Chalk solution on the surface of the work pieces leave it for dry.

4. Mark the given dimensions on the work pieces using steel rule and scriber.

5. Cut the work piece by using hacksaw to get the V shape and make its counterpart to make V shape fit.

6. After cutting, do the filing operation for finishing on all the cutting edges of the work pieces.

Precautions:

1. Dimensions should be drawn properly.

2. Allowance should be given before cutting the material.

3. Work pieces should be firmly fixed in the bench vice.

Result:

Finally prepared a V shape fit on a given metal work piece by using fitting operation.

Viva-Voce Questions:

1. What is the main difference between the hand hammers used in a smithy shop and a fitting shop?

2. What is the difference between hand hacksaw used in fitting shop and the saws used in carpentry shop?

3. How will you achieve surface finish using fitting operation?

Exp No: 7

L - SHAPE FIT

Aim:

To make a L shape fit on a given metal work piece by using fitting operation.

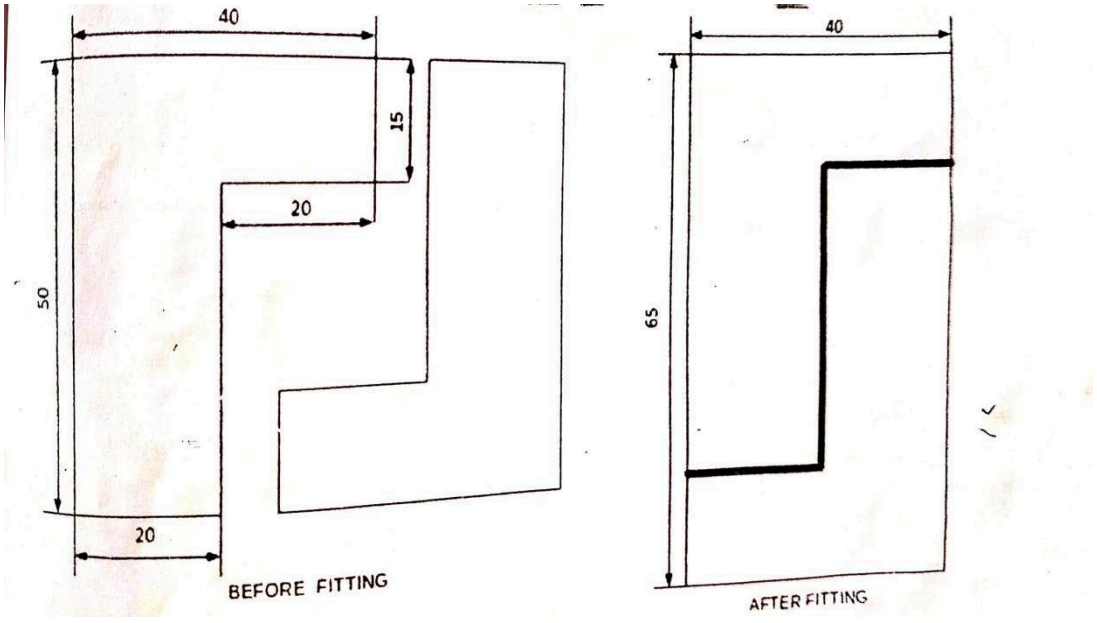
Tools Required:

Bench vice, Steel rule, Flat file, square file, Dot punch, Scriber, Hack saw blade with frame, Tri square, Ball peen hammer.

Material Used:

Work piece - MS flat plate of 50 X 40 X 5 mm^3

Job Diagram:



Procedure:

1. Cut the work piece by using hacksaw to get the L shape and make its counterpart to make L shape fit.

2. After cutting, do the filing operation for finishing on all the cutting edges of the work pieces.

3. Cut a pair of flat pieces of required dimension using power hacksaw machine.

4. Check both edges for squareness using Tri - square.

5. Apply the Chalk solution on the surface of the work pieces leave it for dry.

6. Mark the given dimensions on the work pieces using steel rule and scriber.

Precautions:

1. Dimensions should be drawn properly.

2. Allowance should be given before cutting the material.

3. Work pieces should be firmly fixed in the bench vice.

Result:

Finally prepared a L shape fit on a given metal work piece by using fitting operation.

Viva- voce Questions:

1. Name the various clamping tools used in fitting shop?

2. Name the various types of measuring tools used in fitting shop?

3. What is the difference between sawing and filing operation?

HOUSE WIRING

Exp No: 8

HOUSE WIRING INCLUDING WITH SERIES, PARALLEL AND STAIR CASE CONNECTION

Aim:

Connection of the household appliances in parallel, series and stair case configuration

Tools Required:

Screw driver, cutting plier, Tester, Plaster, Connecting wires.

Fluorescent Lamps: 1 No

Switches: 5 No’s

Two-way switches: 2 No’s

Three pin plugs: 2 No’s

Fuse: 6A

Indicator: 1 No

Incandescent Lamps: 5 No’s

Material used:

The wires used in house wiring contain multi strand copper wires, covered with PVC insulation.

Circuit Diagram:

Symbols:

Ph: Phase
N: Neutral

MCB: Miniature Circuit Breaker

S: Switch (single pole single through (SPST))

TS: Two-way switch (Single Pole Double Through (SPDT))

L: Lamp

Procedure:

1. Take 3 types of wires for our convenience preferably Red, Green, and Black wires.

2. Green wire is used to give earth connections.

3. Black wire for neutral connections, Red for phase connections.

4. From the mains give the connections to the fuse from that give connection to indicator.

5. check from above connections whether the current is passing or not in the circuit.

6. Next from that give the connection to switch this controls the flow of current, from this give connection to socket.

7. Observe the circuit diagram & complete the remaining connections.

Precautions:

1. Wear shoes while doing experiment.

2. Don’t touch any open terminals without confirming that main is OFF.

3. Use the tester while testing any electrical device.

Viva- Voce Questions:

1. Discuss the applications of series, parallel and stair case configurations.

2. Why third pin is bigger than other two pins on a 3-pin plug?

3. What is the importance of earthing?

4. Which electrical quantity is constant in series and parallel connections?

Result:

Various configurations of house wiring have been done and its applications discussed.

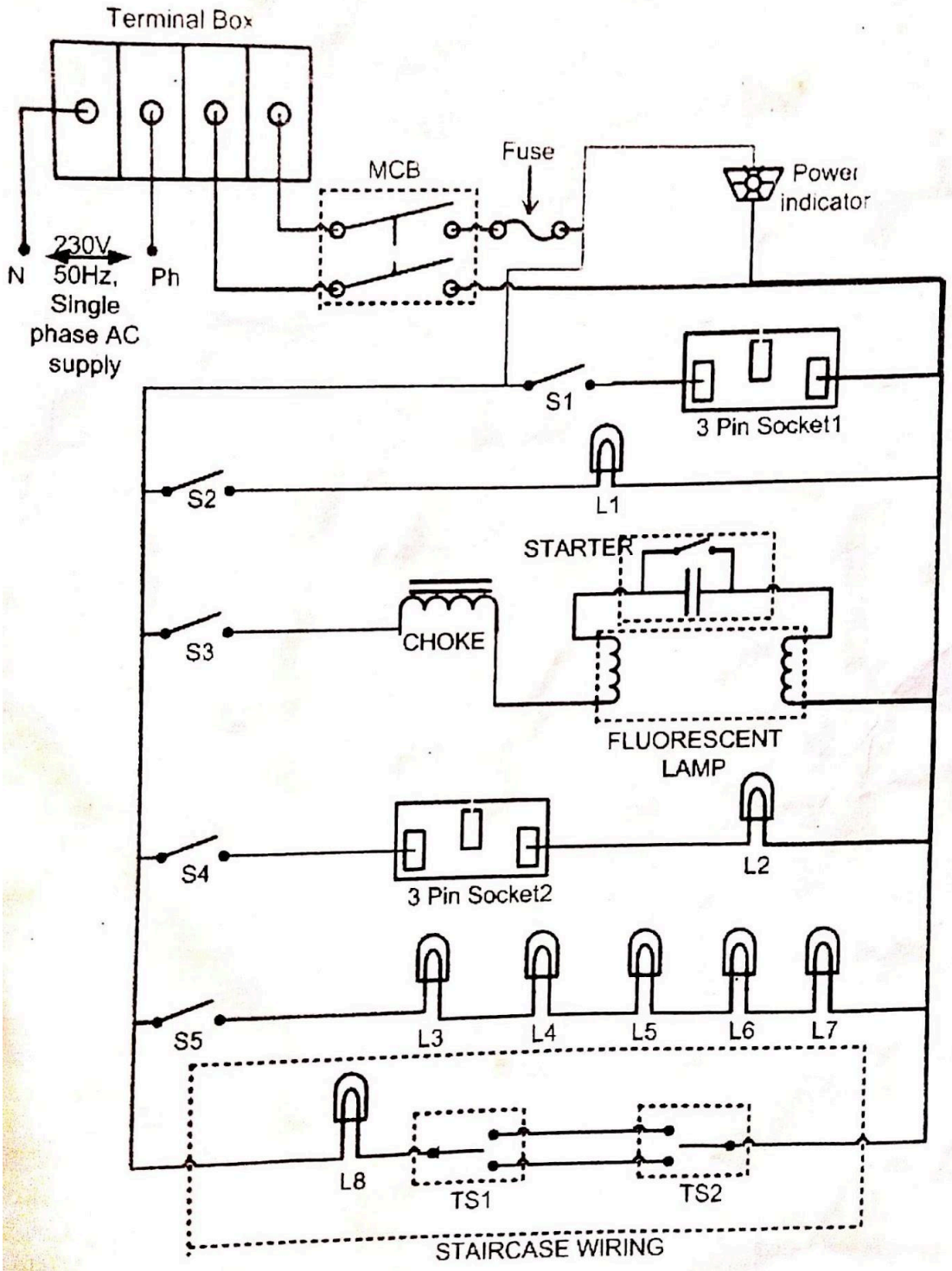


Fig.1 House Wiring Circuit Diagram

Exp No: 9

STAIRCASE WIRING CONNECTION

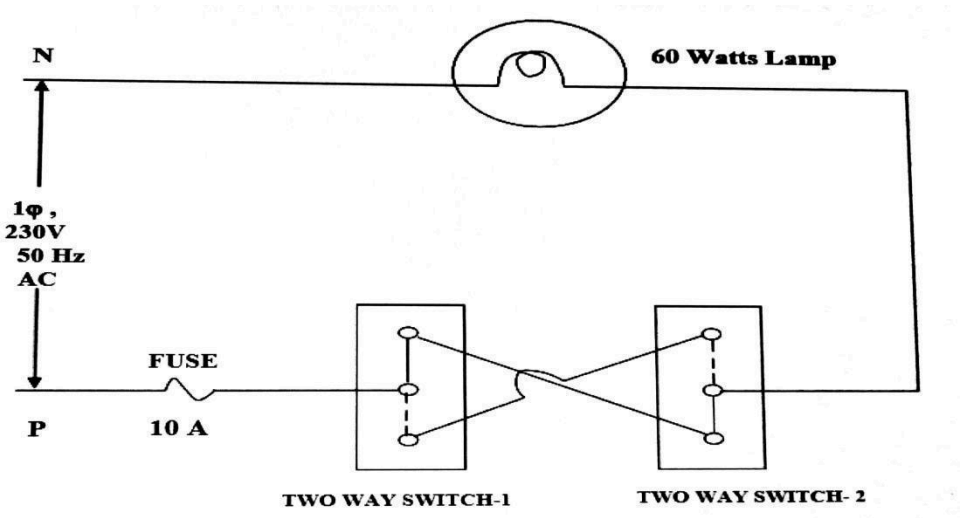
Aim:

To wire for a stair case arrangement using a two-way switch.

Tool Required:

Screw driver, Hammer, Pliers, Line tester, Two-way switches, Bulb holders, Bulbs, Joint clips, Wires, Screws, Ceiling rose and, Switch board.

Circuit Diagram:



Procedure:

1. Mark switch and bulb location points and draw lines for wiring on the wooden Board.

2. Place wires along the lines and fix them with the help of clips.

3. Fix the two-way switches and bulb holder in the marked position on the wooden Board.

4. Complete the wiring as per the wiring diagram.

5. Test the working of the bulbs by giving electric supply to the circuit.

Precautions:

1. Wear shoes while doing experiment.

2. Don’t touch any open terminals without confirming that main is OFF.

3. Use the tester while testing any electrical device.

Result:

The staircase wiring is completed and tested.

Viva- Voce Questions:

1. What is staircase and its types?

2. Which logic gate is used in staircase wiring?

3. What is the importance of earthing?

Exp No: 10

GO DOWN WIRING CONNECTION

Aim:

To carry out godown wiring in casing capping

Apparatus:

1. Casing and Capping (PVC)
2. Button Holder (PVC) 5A, 250V
3. Single Pole Double Throw Switch5A, 250V
4. Single Pole Single Throw Switch5A, 250V
5. Single PVC wire 1/18
6. Square Boxes (PVC)
7. Gang Box
8. Screws (35mmx8mm, 25mmx8mm, 15mmx8mm)

Tools:

Poker, Screw Driver, Tester, Combination Pliers, Hacksaw Blade, Electrician's knife, Hammer.

Procedure:

1. Get the casing and capping to the required length i.e., 6" per price.

2. Fix the capping on a wooden board with a 15mm*8mm screw. Before fixing the capping, a hole should be made with poker on capping and on the board.

3. Place wires in the casing. Care should be taken to leave 6 inches of wire at the ends to help in connection.

4. Cover the casing with capping by pressing one against the other.

5. Pass the wires through the square boxes and gang boxes for connecting to the batten holder and switch resp.

6. Fix the square box on the board with 35mm*8mm screws.

7. Connect the batten holder and switches as shown. Care should be taken that wires are straight and don't touch each other.

8. Fix the batten holder and switches on the square box and gang box with 25mm*8mm screws.

9. Text the wiring after completion with a series test lamp.

Precautions:

1. Wear shoes while doing experiment.

2. Don't touch any open terminals without confirming that main is OFF.

3. Use the tester while testing any electrical device.

Result:

This type of wiring is used in go downs having more than one room.

Viva-Vose Questions:

1. Which type of switch is used in go down wiring?

2. Discuss the applications of go down wiring?

3. What is the main difference between go down wiring and staircase wiring?

Circuit Diagram:

