



MARRI LAXMAN REDDY **INSTITUTE OF TECHNOLOGY AND MANAGEMENT**

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

DEPARTMENT OF MECHANICAL ENGINEERING **INSTRUMENTATION AND CONTROL SYSTEMS** **LAB MANUAL**



SUBJECT NAME	INSTRUMENTATION AND CONTROL SYSTEM LAB
SUBJECT CODE	2070384
COURSE-BRANCH	B. Tech – Mechanical Engineering
YEAR-SEMESTER	IV-I
ACADEMIC YEAR	2024-2025
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CERTIFICATE

This is to certify that this manual is a Bonafide record of practical work in **Engineering Workshop** in I & II Semesters of I year **B. Tech - Programme** during the academic year **2024-25**. This manual is prepared by **Dr. G. SURYA PRAKASH RAO** , **Associate Professor**, Department of Mechanical Engineering.

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PREFACE

The **Mechanical Engineering Laboratory - Engineering Workshop** in I & II Semesters of I year **B. Tech - Programme** is designed to provide students with hands-on experience in fundamental mechanical engineering principles. This laboratory serves as a structure between Practical , theoretical concepts and real-world applications, ensuring a extending far downward, inward, or backward or having a specified dimension understanding of mechanical engineering process, work on experiment behavior, and measurement techniques.

The experiments included in this laboratory manual cover essential in mechanical engineering principles such as Carpentry, Fitting, Tin Smithy, Black Smithy, House Wiring and Welding experiment and analysis. Each experiment is carefully structured to strengthen or support practical , theoretical, knowledge and develop practical skills in experiment analysis and trace and correct faults in a mechanical.

By this laboratory experiments, students will gain valuable experience in practical and theoretical in draw design, analysis, and validation of fundamental mechanical engineering concepts. The practical exposure provided by this laboratory will not only enhance their academic understanding but also prepare them for industrial and research applications. We hope this manual will serve as a useful guide in exploring the principles of mechanical engineering and help students to develop the necessary communications and technical skills for their future endeavors.

By
Dr. G. SURYA PRAKASH RAO,
Associate Professor,
Mechanical Engineering Department.

ACKNOWLEDGEMENT

It was really a good experience dealing with the **Engineering Workshop Laboratory**. First, I would like to thank **Dr. U. Sudhakar**, Associate Professor & Head of the Department of Mechanical Engineering, **Marri Laxman Reddy Institute of Technology & Management** for his concern and giving the technical support in preparing the document.

I gratefully acknowledge the constant support and valuable patronage of **Dr. P. Sridhar, Director**, **Marri Laxman Reddy Institute of Technology & Management** for giving me this wonderful opportunity for preparing the Engineering Workshop laboratory manual.

I express my heartfelt thanks to **Dr. R. Murali Prasad, Principal**, Marri Laxman Reddy Institute of Technology & Management, for timely corrections and scholarly guidance.

At last, but not the least I would like to thank all the Mechanical Department faculty members those who guided and helped me in preparing this manual.

By
Dr. G. SURYA PRAKASH RAO,
Associate Professor,
Mechanical Engineering Department.

GENERAL INSTRUCTIONS

- 1) The objective of the laboratory is learning. The experiments are designed to illustrate phenomena in different areas of Workshop and to expose you to uses of instruments.
Conduct the job with interest and an attitude of learning.
- 2) You need to come well prepared for the job.
- 3) Work quietly and carefully (the whole purpose of experimentation is to make reliable measurements) and equally share the work with your partners.
- 4) All presentations of job and diagram should be neatly and carefully done.
- 5) Diagrams should be neatly drawn with pencil. Always display units.
- 6) Come equipped with scales, pencils etc.
- 7) Do not fiddle idly with apparatus. Handle instruments with care. Report any breakage to the Instructor. Return all the equipment you have signed out for the purpose of your experiment.

SAFETY PRECAUTIONS

General Guidelines

- 1) Conduct yourself in a responsible manner at all times in the laboratory.
- 2) Be *familiar with your lab experiment before you come to the lab*. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the lecturer/instructor/technician before proceeding.
- 3) No student may work in the laboratory alone. The lab instructor/lecturer grant exceptions on a case by case basis.
- 4) When first entering a laboratory, do not touch any equipment or other materials in the laboratory area until you are instructed to do so.
- 5) *Do not eat, drink beverages or chew gum in the laboratory*. Do not use laboratory glassware as containers for food or beverages.
- 6) *Smoking is strictly not allowed* in any indoor area.
- 7) No music allowed in the laboratory. Radio (including walk-man) and other entertainment devices are not permitted.
- 8) No cellular phone is allowed in this laboratory.

CLOTHING

1. *Safety goggles and safety jacket must be worn* whenever you work in lab.
2. *Gloves should be worn whenever you use chemicals* that cause skin irritations or need to handle hot equipment.
3. *Mask should be worn every time you prepare the chemicals*.

4. *Safety shoes and hard hat should be worn* at all times while in the laboratory.
5. Contact lenses should not be worn in the laboratory unless you have permission from your instructor.
6. Dress properly during a laboratory activity.
7. Long hair, dangling jewellery and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back and dangling jewellery and loose or baggy clothing must be secured.
8. Sandal, open-toed shoes, high heels or shoes with holes in the soles will not be worn in the lab.
9. Shorts and skirts are not permitted.

GUIDELINES TO WRITE YOUR OBSERVATION BOOK

1. Experiment title, Aim, Apparatus, Procedure should be right side.
2. Draw diagrams, 2D and 3D Dissensions diagrams should be left side.
3. To write Theoretical matter from right side as per convenience.
4. Result should be always the end (i.e. there should be nothing written related to an experiment after its result).
5. You have to write the information for all the experiments in your observation book.
6. You are advised to leave sufficient no. of pages between successive experiments in your observation

book for the purpose of lab practical and theory.

INSTITUTION VISION AND MISSION

VISION

To be as an ideal academic institution by graduating talented engineers to be ethically strong, competent with quality research and technologies.

MISSION

To fulfill the promised vision through the following strategic characteristics and aspirations:

- Utilize rigorous educational experiences to produce talented Engineers
- Create an atmosphere that facilitates the success of students
- Programs that integrate global awareness, communication skills and Leadership qualities
- Education and Research partnership with institutions and industries to prepare the students for interdisciplinary research.

QUALITY POLICY

1.The management is committed in assuring quality service to all its stake holders, students,parents, alumni, employers and the community.

2.Our commitment and dedication are built into our policy of continual quality improvement by establishing and implementing mechanism and modalities ensuring accountability at all levels,transparency in procedures and access to information and actions.

VISION AND MISSION OF THE DEPARTMENT

Vision Statement:

“The **Mechanical Engineering Department** strives for immense success in the field of education, research and development by nurturing the budding minds of young engineers inventing sets of new designs and new products which may be envisaged as the modalities to bring about a green future for humanity”.

Mission Statement:

- Equipping the students with manifold technical knowledge to make them efficient and independent thinkers and designers in national and international arena.
- Encouraging students and faculties to be creative and to develop analytical abilities and efficiency in applying theories into practice, to develop and disseminate new knowledge.
- Pursuing collaborative work in research and development organizations, industrial enterprises,
- Research and academic institutions of national and international, to introduce new knowledge and methods in engineering teaching and research in order to orient young minds towards industrial development.

Course Objectives:

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.

8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

PROGRAMME OUTCOMES (PO's)

List of Programme Outcomes:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

societal and environmental contexts, demonstrate the knowledge and need for sustainable development.

PO8: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instruction

PO10: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO11: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUT COMES

PROGRAM SPECIFIC OUT COMES (PSO):

PSO1: Students acquire necessary technical skills in Mechanical Engineering that make them employable graduate.

PSO2: An ability to impart technological inputs towards development of society by becoming an entrepreneur.

ATTAINMENT OF PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

Exp. No	Name of the Experiment	Program Outcomes Attained	Program Specific Outcomes Attained
1	To Prepare T - Lap Joint.	PO 1, PO 2, PO 4	PSO 1, PSO 2
2	To Prepare a L - Fit.	PO 1, PO 2, PO 4	PSO 1, PSO 2
3	To Prepare a Round Tin.	PO 1, PO 2, PO 3, PO 4	PSO 1, PSO 2
4	To Prepare a J - Shape.	PO 1, PO 2, PO 3, PO 4, PO 5	PSO 1, PSO 2
5	To Prepare a wiring to control two Lamps connected in series.	PO 1, PO 2, PO 3, PO 4	PSO 1, PSO 2
6	To Prepare a Butt - Joint.	PO 1, PO 2, PO 4	PSO 1, PSO 2
7	To Prepare Dovedtail - Lap Joint.	PO 1, PO 2, PO 4	PSO 1, PSO 2
8	To Prepare a V- Fit.	PO 1, PO 2, PO 4	PSO 1, PSO 2
9	To Prepare a Rectangular Tray.	PO 1, PO 2, PO 3, PO 4, PO 5	PSO 1, PSO 2
10	To Prepare a S - Hook.	PO 1, PO 2, PO 3, PO 4,	PSO 1, PSO 2
11	To Prepare a wiring to control two Lamps connected in parallel.	PO 1, PO 2, PO 3, PO 4, PO 5	PSO 1, PSO 2
12	To Prepare a Double Lap Joint	PO 1, PO 2, PO 3, PO 4,	PSO 1, PSO 2

COURSE STRUCTURE, OBJECTIVES & OUTCOMES**COURSE STRUCTURE:**

The Mechanical Engineering Laboratory will have a continuous evaluation during I & II semester for 40 sessional marks and 60 marks End semester examination marks.

Out of the 40 marks for internal evaluation, day-to-day in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 25 marks conducted by the concerned Laboratory Teacher.

The End semester examination shall be conducted with an external examiner and internal examiner.

The external examiner shall be appointed by the Principal / Chief Controller of Examinations.

Course Objectives:

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

Programme Outcomes: At the end of the course, the student will be able to:

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, house wiring and welding.
3. Apply basic electrical engineering knowledge for house wiring practice.
4. Ability to make various basic prototypes In the tread of Tin Smithy such as Rectangular Tray, and Open Cylinder.
5. Ability to design and model various basic prototype in the tread of welding such as Lap Joint, T - Lap Joint.
6. Ability to design and model different prototype in the Carpentry tread such as Cross - Lap Joint, Dovetail Joint.

Department of Mechanical Engineering

2410372 : ENGINEERING WORKSHOP LABORATORY**COURSE CONTENT:****EXERCISES FOR ENGINEERING WORKSHOP LABORATORY**

Perform All Experiments given Below

Exp. No	Name of the Experiment
1	To Prepare T - Lap Joint.
2	To Prepare a L - Fit.
3	To Prepare a Round Tin.
4	To Prepare a J - Shape.
5	To Prepare a wiring to control two Lamps connected in series.
6	To Prepare a Butt - Joint.
7	To Prepare Dovedtail - Lap Joint.
8	To Prepare a V- Fit.
9	To Prepare a Rectangular Tray.
10	To Prepare a S - Hook.
11	To Prepare a wiring to control two Lamps connected in parallel.
12	To Prepare a Double Lap Joint

TEXT BOOKS:

Workshop Practice / B. L. Juneja / Cengage.

Workshop Manual y / K. Venugopal / Anurdha

REFERENCE BOOKS:

1. Workshop Manual - P. Kannaiah / K. L. Narayana / SciTech.
2. Workshop Manual / Venkat Reddy / BSP.

AIM: To prepare T - lap joint as per dimensions.

MATERIAL REQUIRED:

wood 50 mm x 25 mm x 300 mm.

TOOLS REQUIRED:

1. Carpenters vice (6")
2. Steel rule (12")
3. Marking gauge (6")
4. Metal jack plane (45 mm)
5. Firmer chisel (30 mm)
6. Mallet (1 kg)
7. Wood rasp file (100 mm)
8. Try square (9")
9. Cross cut saw (300 mm)

SEQUENCEING OPERATIONS:

1. Initial measuring
2. Rough planning
3. Smooth planning
4. Marking
5. Cutting
6. Hammering
7. Chiseling
8. Filing
9. Final Finishing

WORKING PROCEDURE:

1. The given wood is checked for dimensions.
2. One side is planed with metal jackplane and checked for trueness by try square.
3. The four sides are also planned.
4. The excess material is cut by cross cut saw.
5. Now the portions for lapping are marked.

6. After sawing remove the waste material by firmer chisel.
7. If the material is still remained in 2 or 3 mm, and then removes by filing with wood rasp file.

SAFETY PRECAUTIONS:

1. Do not keep the tools at the edge of the workbench.
2. Do not keep the plane horizontal in idle mode.
3. Care must be taken while sawing operation.

RESULTS:

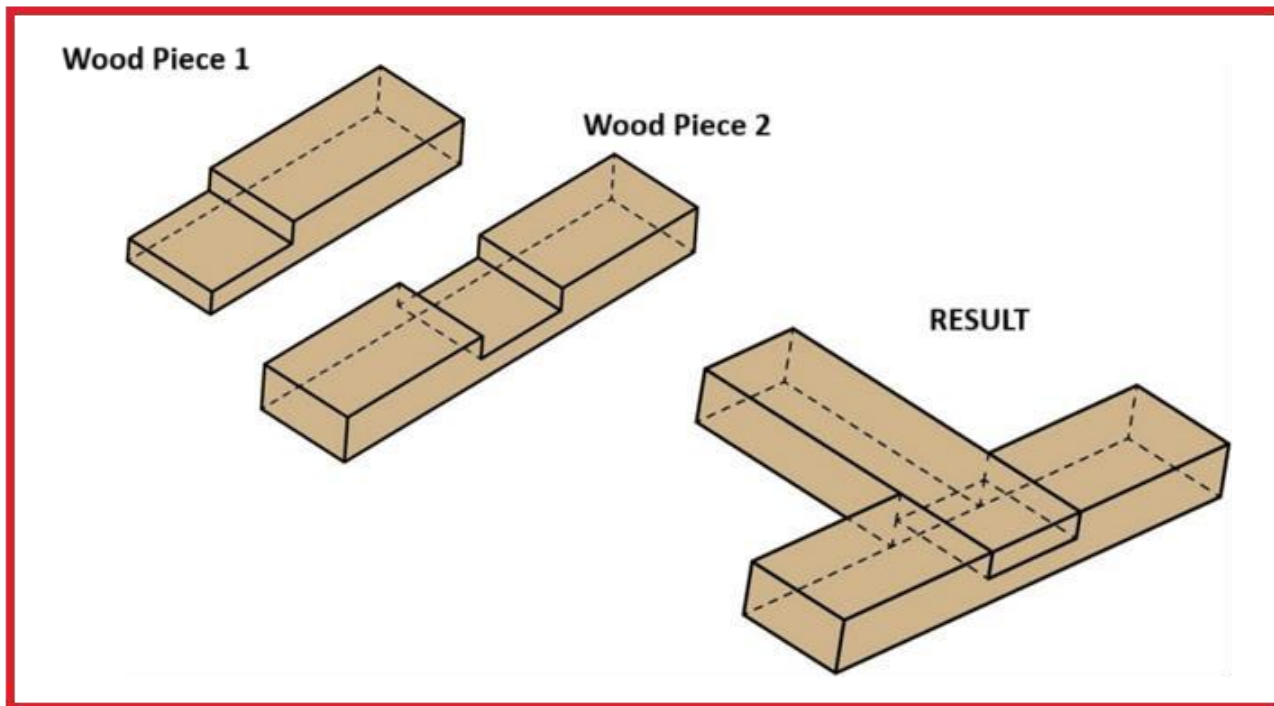


FIG: T - LAP JOINT

VIVA QUESTIONS

1. What is the importance of workshop?
2. Name the common carpentry tools?
3. What is the use for firmer chisel?
4. What is the use of metal jack plane?
5. What is the use of Rasp file?
6. Name the carpentry process?
7. What are the uses of wood?
8. What is the use of the bench vice?
9. What are the striking tools?
10. Define Carpentry?

11. What is Timber?
12. Name the type of timbers and give examples?
13. What are the types of rules used for measuring?
14. What is the use of Try-square?
15. What are the types of gauges used in carpentry?
16. What is the use of calipers?
17. What is the need of spirit level?
18. What is the chisel Material and types used in carpentry?
19. What are the types of carpentry joints?
20. What is the need of Bench vice?

EX. NO: 1.2**DOVETAIL LAP JOINT****DATE:**

AIM: To prepare Dovetail lap joint as per dimensions.

MATERIAL REQUIRED:

Wood 50 mm x 50 mm x 300 mm.

TOOLS REQUIRED:

1. Carpenters vice
2. Steel rule
3. Marking gauge
4. Metal-jack plane
5. Firmer chisel
6. Mallet
7. Wood rasp file
8. Try square
9. Cross cut saw

SEQUENCEING OPERATIONS:

1. Initial measuring
2. Edge Preparation
3. Rough planning
4. Smooth planning
5. Marking
6. Cutting
7. Hammering
8. Chiseling
9. Filing
10. Final Finishing

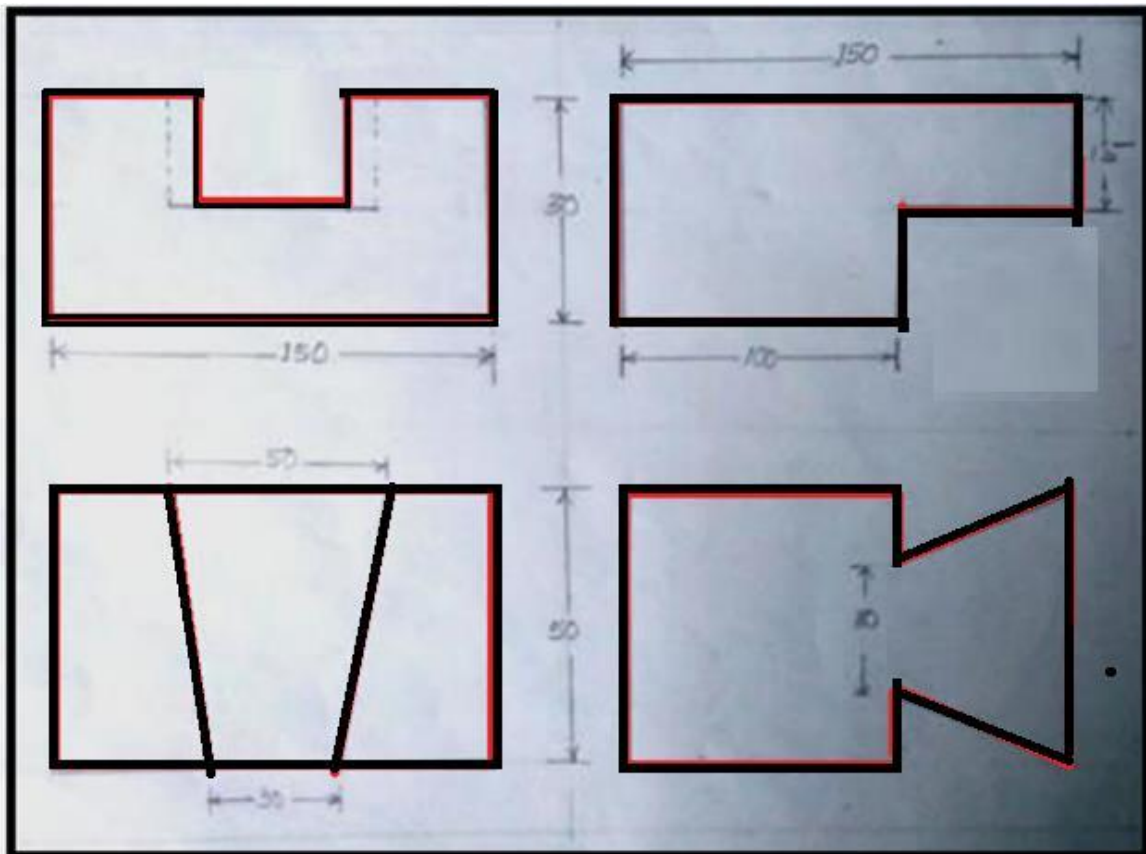
WORKING PROCEDURE:

1. The given wood is checked for dimensions.
2. One side is planed with metal jack plane and checked for trueness by try square,
3. The four sides are also planned.
4. The excess material is cut by cross cut saw.
5. Now the portions for lapping are marked.
6. After sawing remove the waste material by firmer chisel.
7. If the material is still remained in 2 or 3 mm, then remove by filing with wood rasp file.

SAFETY PRECAUTIONS:

1. Do not keep the tools at the edge of the workbench.
2. Do not keep the plane horizontal in idle mode.
3. Care must be taken while sawing operation.

RESULTS:

**FIG: DOVETAIL LAP JOINT**

VIVA QUESTIONS

1. What is the importance of workshop?
2. Name the common carpentry tools?
3. What is the use for firmer chisel?
4. What is the use of metal jack plane?
5. What is the use of Rasp file?
6. Name the carpentry process?
7. What are the uses of wood?
8. What is the use of the bench vice?
9. What are the striking tools?
10. Define Carpentry?

11. What is Timber?
12. Name the type of timbers and give examples?
13. What are the types of rules used for measuring?
14. What is the use of Try-square?
15. What are the types of gauges used in carpentry?
16. What is the use of calipers?
17. What is the need of spirit level?
18. What is the chisel Material and types used in carpentry?
19. What are the types of carpentry joints?
20. What is the need of Bench vice?

EX. NO: 2.1**L - FIT****DATE:**

AIM: To prepare a L-fit.

MATERIAL REQUIRED:

MS FLAT of 50 mm X 50 mm X 5 mm.

TOOLS REQUIRED:

- 1).150 mm Try square
- 2).250 gm Ball peen hammers
- 3) Dot punch
- 4) Centre punch
- 5) scribe
- 6) 15cm Steel rule
- 7) Odd leg Caliper

- 8) Vernier height Gauge
- 9) Chisel
- 12) 250mm Rough and Smooth square files
- 13) 6mm rough and Shank square files
- 14) 3mm Straight Shank Drill Bit.
- 15) Half round file
- 16) Divider.

PROCEDURE:

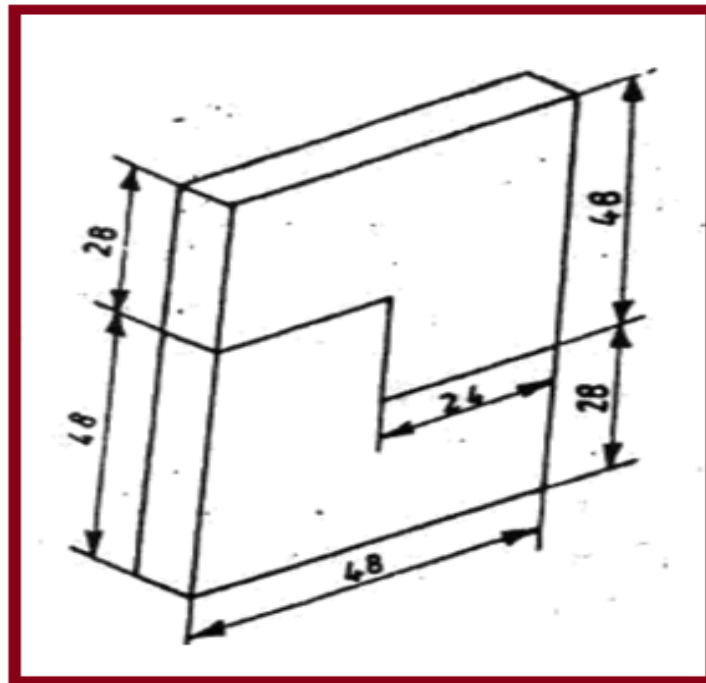
1. The given material is checked for (48X48X2) dimensions.
2. One edge of the given MS Flat is filed to straightness with rough and smooth files and check with try square for flatness.
3. An Adjacent edge is also filed such that it is a square to the first one and checked with try square. Wet chalk is applied on one side of the flat and dried for marking.
4. Marking is done in accordance with the dimensions using vernier height gauge
5. Using dot punch, dots are made along the marking lines.
6. The excess material is cut with hacksaw and then filed to correct size. Care taken to see that the marking dots are not crossed.
7. Finish the mating surfaces with rough file followed by smooth file.
8. Prepare the counterpart in similar way.
9. File the other surfaces also and remove burns and rust.

PRECAUTIONS:

Never remove chips with hand, use always a brush to remove chips.

Working tools should not be kept at the edge of the table.

While sawing, secure the work rigidly.

RESULTS:**VIVA QUESTIONS**

1. What is meant by fitting?
2. What is the use of vice and give the various types of vice?
3. State the different types of hammers used in fitting work.
4. What is the use of V- block?
5. What are the materials used for files?
6. What are the methods of filing?
7. What is the composition of high speed steel?
8. What is meant by peening or swaging?
9. What are the different types of punches?
10. What is a wrench?
11. What is the material used for making hacksaw blades?
12. When should a blade with 32 teeth per inch be used?
13. What are the causes of breaking of hacksaw blades?
14. How to specify a vice?
15. What are the types of wrenches?

16. What is a torque wrench?
17. Name the material out of which the vice is made.
18. Name the different types of drills used in fitting shop?
19. How can a tap drill step be determined?
20. What is the length of available steel rule?
21. What is the material used in making taps?
22. What is the use of tap?
23. Name the files which are classified based on longitudinal shape and cross section.

EX. NO:2.2**V- FITTING****DATE:** _____**AIM:** To prepare a V- FITTING.**MATERIAL REQUIRED:**

MS FLAT of 80 mm X 40 mm X 5 mm.

Tools required:

- 1).150 mm Try square 2).250 gm Ball peen hammers 3) Dot punch
- 4) Centre punch 5) scriber 6) 15cm Steel rule 7) Odd leg Calliper
- 8) vernier height Gauge 9) Chisel 12)250mm Rough and Smooth square files
- 13) 6mm rough and Shank square files 14) 3mm Straight Shank Drill Bit.
- 15) Half round file 16) Divider.

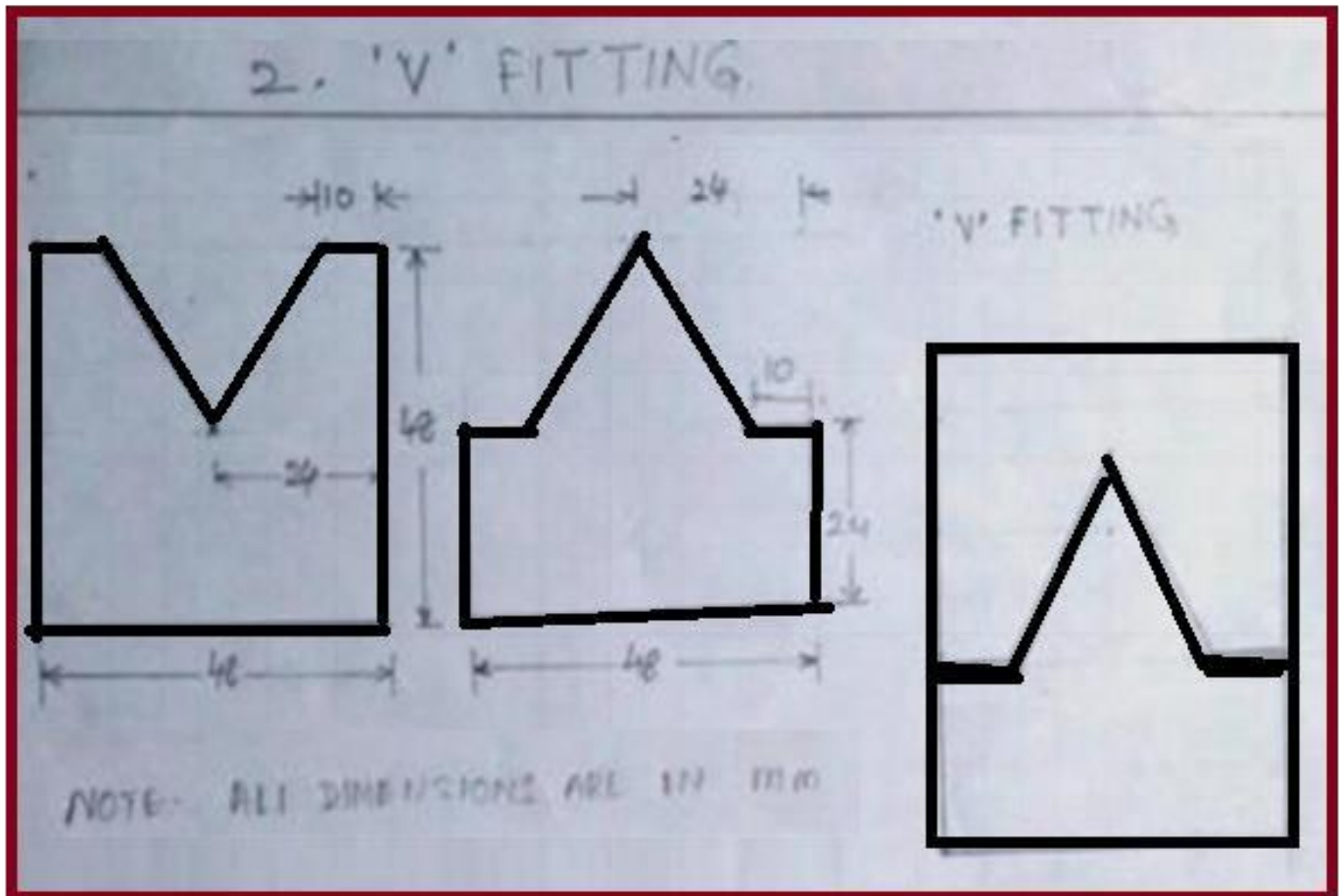
PROCEDURE:

- 1) The given material is checked for (40X40X5) dimensions.
- 2) One edge of the given MS Flat is filed to straightness with rough and smooth files and check with try square for flatness.
- 3) An Adjacent edge is also filed such that it is a square to the first one and checked with try square.
- 4) Wet chalk is applied on one side of the flat and dried for marking.

- 5) Marking is done in accordance with the dimensions using vernier height gauge 6) Using dot punch, dots are made along the marking lines.
- 7) The excess material is cut with hacksaw and then filed to correct size. Care taken to see that the marking dots are not crossed.
- 8) Finish the mating surfaces with rough file followed by smooth file.
- 9) Prepare the counterpart in similar way.
- 10) File the other surfaces also and remove burns and rust.

Precautions:

- 1) Never remove chips with hand, use always a brush to remove chips.
- 2) Working tools should not be kept at the edge of the table.
- 3) While sawing, secure the work rigidly.

RESULTS:

VIVA QUESTIONS

1. What is the mechanical meaning of fitting?
2. What is The Use of Try Square?
3. What Is The Name Of Vice Used In Fitting Shop?
4. Name the different files?
5. Which tools are used in fitting shop?
6. What is the use of center punch?
7. Write any five advantages of wood over the other materials?
8. What is bench vice made up of?
9. Should the hardness of work piece be same as that of the file?
10. what is a file?
11. What is meant by fitting?
12. What is the use of vice and give the various types of vice?
13. State the different types of hammers used in fitting work.
14. What is the use of V- block?
15. What are the materials used for files?
16. What are the methods of filing?
17. What is the composition of high speed steel?
18. What is meant by peening or swaging?
19. What are the different types of punches?
20. What is a wrench?
21. What is the material used for making hacksaw blades?

EX.NO:3.1**ROUND TIN****DATE:**

AIM: To prepare a ROUND TIN from the sheet metal as per given dimensions.

MATERIALS REQUIRED:

GI Sheet of size 110 mm X 70 mm.

TOOLS REQUIRED:

1. Scriber
2. Straight snip
3. Beak horn
4. Hatchet stake
5. Steel rule 12"
6. Mallet

PROCEDURE:

1. In order to obtain correct size and shape of the article, prepare a template.
2. The template is drawn directly on the sheet metal.
3. The sheet is cut with the help of snip and the notching operation is carried out to obtain the desired shape.
4. The sheet metal is bent along the marked lines by striking with a mallet on proper stake.
5. The edge of the sheet metal is folded to strengthen the edge and to eliminate the sharp edges.
6. Finally seaming operation is completed to obtain the rectangular tray.

PRECAUTIONS:

1. Never carry tools in pockets.
2. Do not try to hold sheet with bare hands.
3. Remove scrap metal to avoid injuries.

RESULTS:

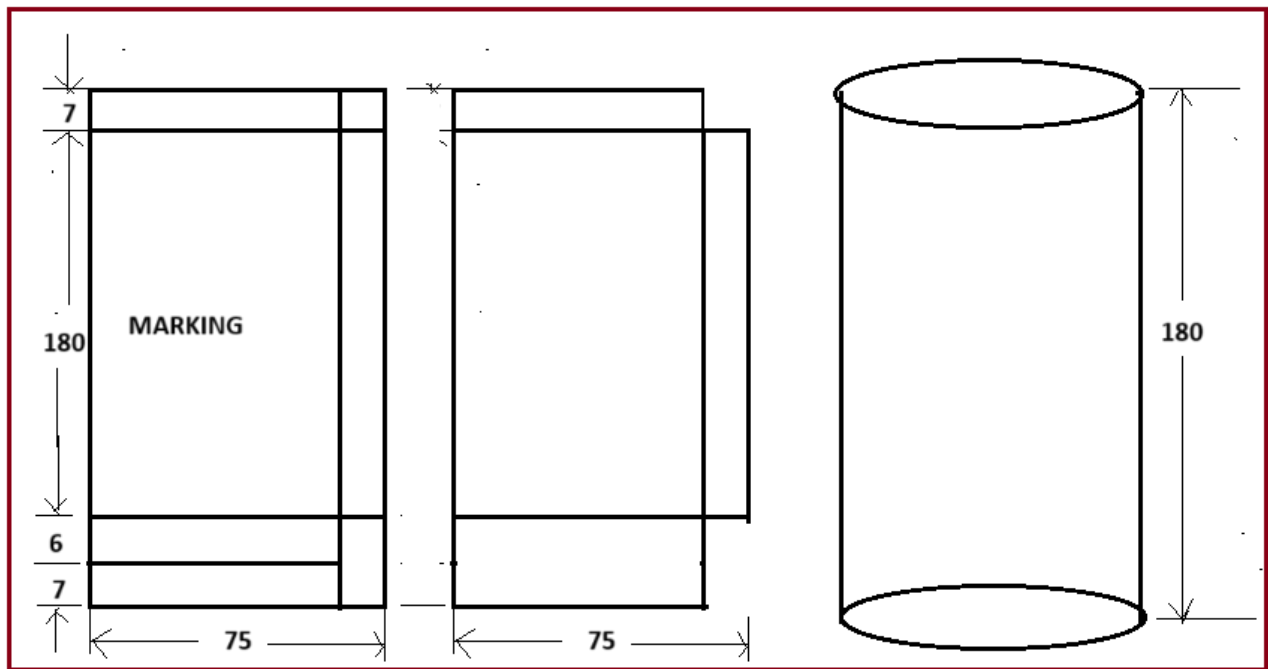


FIG: EXPERIMENTDIAGRAM

VIVA VOCE

- 1) Define sheet metal work?
- 2) What are the applications of sheet metal working?
- 3) What is the principle behind the sheet metal layout?
- 4) How do you identify the thickness of metal sheet?
- 5) What will be the result of the sheet thickness when increasing the gauge number?
- 6) What are the metals used in sheet metal work?
- 7) Name the striking tools used in sheet metal work?
- 8) Name the five tools and equipments which are used for cutting sheet metal?
- 9) What is a snip?
- 10) What are the types of snips?
- 11) Define punching operation?
- 12) Define nibbling operation in sheet metal work?
- 13) How will you design the diameter of rivet for sheet metal work?
- 14) Name the various sheet metal operations?
- 15) What is hem?
- 16) What are the functions of hem?
- 17) What is seam?
- 18) Double seam is..... than single seam 19) What are the different types of seam?

EX.NO:3.2**RECTANGULAR TRAY****DATE:**

AIM: To prepare Rectangular Tray from the sheet metal as per given dimensions.

MATERIALS REQUIRED:

Two GI Sheets

TOOLS REQUIRED:

- 1) Scriber
- 2) Straight snip
- 3) Beak horn
- 4) Hatchet stake

- 5) Steel rule 12"
- 6) Mallet

PROCEDURE:

1. The size of the given sheet is checked with steel rule.
2. Mark the measurement and make the development surface sketch diagram.
3. The layout of the tray is marked on given sheet.
4. The layout of the tray is cut by using the straight snips.
5. The sheet is bent to the required shape using stakes and mallet.
6. Now the bent edges are made to overlap each other and stuck with a mallet to get the required joint.
7. The joint is soldered.

PRECAUTIONS:

1. Never carry tools in pockets.
2. Do not try to hold sheet with bare hands.
3. Remove scrap metal to avoid injuries.

RESULTS:

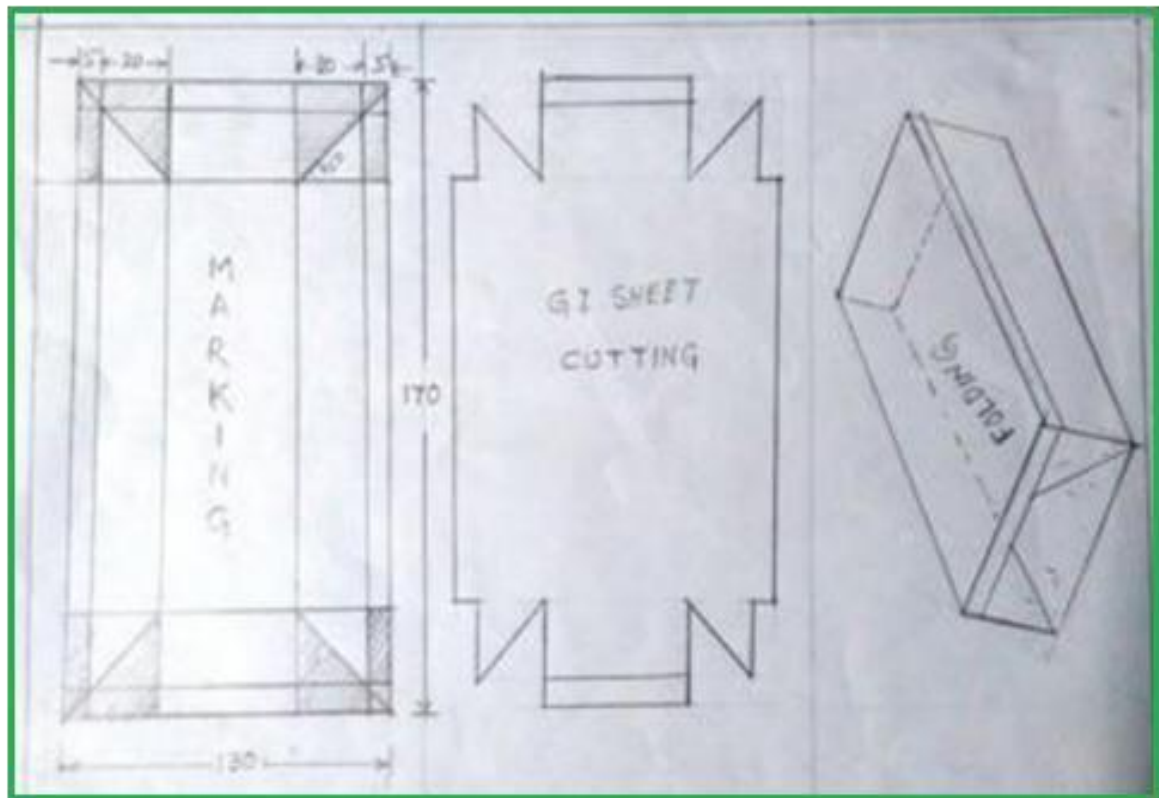


Fig: EXPERIMENT DIAGRAM

VIVA QUESTIONS

1. Define sheet metal work?
2. What are the applications of sheet metal working?
3. What is the principle behind the sheet metal layout?
4. How do you identify the thickness of metal sheet?
5. What will be the result of the sheet thickness when increasing the gauge number?
6. What are the metals used in sheet metal work?
7. Name the striking tools used in sheet metal work?
8. Name the five tools and equipments which are used for cutting sheet metal?
9. What is a snip?
10. What are the types of snips?
11. Define punching operation?
12. Define nibbling operation in sheet metal work?
13. How will you design the diameter of rivet for sheet metal work?

14. Name the various sheet metal operations?
15. What is hem?
16. What are the functions of hem?
17. What is seam?
18. Double seam is than single seam
19. What are the different types of seam?

EX. NO:4.1 TWO LAMPS CONNECTED IN SERIES BY ONE SWITCH.**DATE:**

AIM: To prepare a wiring to control two lamps connected in series by one switch. (SERIES CONNECTION)

TOOLS REQUIRED:

1. Screw driver,
2. Connector,
3. Tester,
4. Lamp holders,
5. One way switch, wires,
6. Wire clips,
7. Bulbs,
8. Wire cutter,
9. Nose plier,
10. Cutting plier,
11. Ball peen hammer

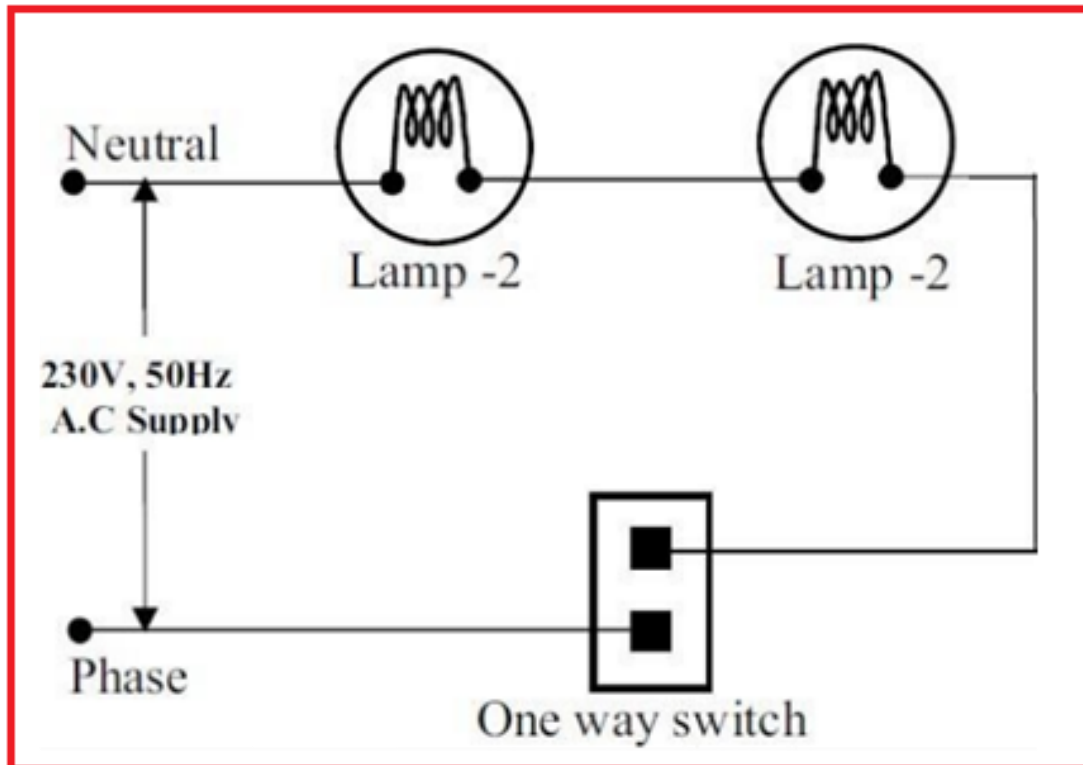
SEQUENCE OF OPERATIONS:

- 1) The outline of the wiring diagram is marked on the wooden wiring board.
- 2) Clips are nailed to the board, following the wire diagram.
- 3) Wires are stretched and clamped with the clips.
- 4) Wires are connected to the holder and the switch as shown in the above diagram, Which are then screwed on the board.
- 5) Bulbs are fitted to the holders.
- 6) The wiring connections are tested by giving power supply.

PRECAUTIONS:

1. Never remove a plug from an outlet by pulling the cord. Always pull by the plug.

2. Whenever there is power failure, put off the power supply to all equipment in order to prevent Spontaneous recovery.
3. Put on mains only ascertaining completion of correct wiring.

RESULTS:**VIVA QUESTIONS**

1. For domestic use, power is supplied through a.....and a.....forming a single phase A.C, two wire system.
2. For industrial establishments, power is supplied through phase.....wire system,
3. Electric switch.....and... the electric circuit.
4. A plug engages with corresponding... contacts.
5. Main switch I only to cut-off the supply of electricity (T/F)

6. A lamp filament is made of.....
7. A multi-core conductor consists of several cores... from each other.
8. Wire sizes are specified by the diameters /length of the wire.
9. The wire specification 14/36 indicates.....stands of SWG.
10. In series circuit, when one device breaks down; the remaining devices operate.(T/F)
11. In parallel circuit, if one device breaks down; the other devices continue to operate.(T/F)
12. Regulator is used for controlling the... of a fan.
13. While using a table fan, always use two/three core flexible wire for connection.
14. Universal fans operate both on AC and DC
15. If the bulb on the handle of an automatic electric iron glows, it means that the iron is cool/hot.
16. The intensity of the glow of an indicator lamp is a measure of voltage/ current level.

EX. NO: 4.2 TWO LAMPS CONNECTED IN PARALLEL BY ONE SWITCH**DATE:**

AIM: To prepare a wiring to control two lamps connected in parallel by one switch.

(PARALLEL CONNECTION)

TOOLS REQUIRED:

1. Screw driver
2. Connector
3. Tester
4. Lamp holders
5. One way switch
6. Wires
7. Wire clips
8. Nails

9. Bulbs
10. Wire cutter
11. Nose pliers
12. Cutting pliers
13. Ball peen hammer.

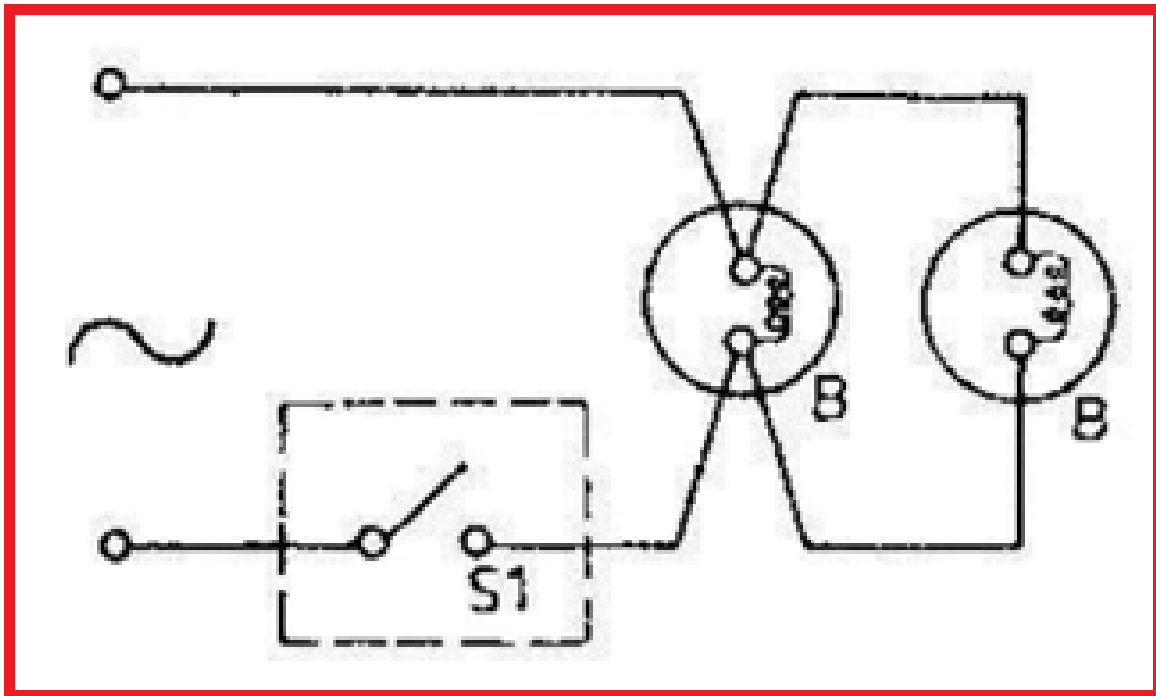
SEQUENCE OF OPERATIONS:

1. The outline of the wiring diagram is marked on the wooden wiring board.
2. Clips are nailed to the board, following the wiring diagram.
3. Wires are stretched and clamped with clips.
4. Wires are connected to the holder and the switch as shown in above diagram, which are then screwed on the board.
5. Bulbs are fitted to the holders.
6. The wiring connections are tested by giving power supply.

SAFETY PRECAUTIONS:

1. Never remove a plug from an outlet by pulling the cord. Always pull the plug.
2. Whenever there is power failure, put off power supply to all equipment in order to prevent spontaneous recovery.
3. Put on mains only after ascertaining completion of correct wiring.

RESULTS:



Viva Questions

1. what is meaning of electrical wiring?
2. what is an electric conductor?
3. What are the tools are required in house wiring ?
4. What is difference between one way switch and two way switch ?
5. What is earthing?
6. Electric switch.....and the electric circuit.
7. A plug engages with corresponding..... contacts.
8. Main switch I only to cut-off the supply of electricity (T/F)
9. A lamp filament is made of.....
10. A multi-core conductor consists of several cores from each other.
11. Wire sizes are specified by the diameters /length of the wire.
12. The wire specification 14/36 indicates..... stands of..... SWG.
13. In series circuit, when one device breaks down; the remaining devices operate. (T/F)
14. How much household supply in India?
15. what are units of current, electromotive force, resistance and power?
16. What is the relation among Volt, ohm and Amperes?

EX.NO: 5.1 BUTT JOINT WITH ARC WELDING**DATE:** _____

Aim: - To prepare a butt joint with mild steel strip using Arc Welding

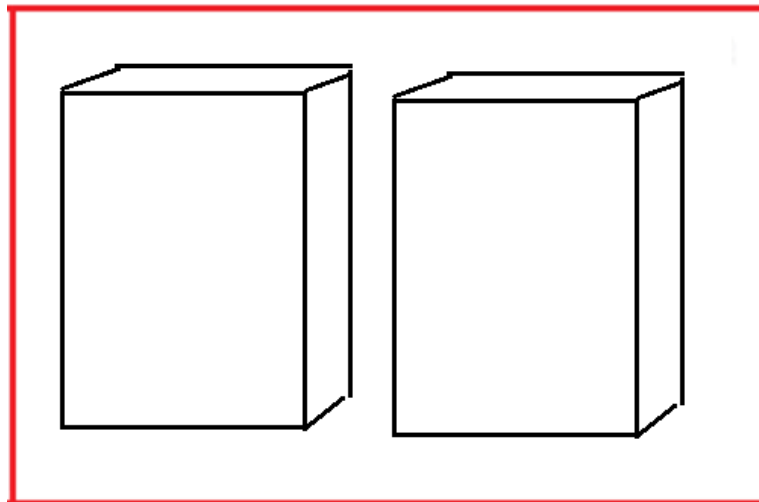
Equipment and materials: -

Welding unit, consumable mild steel Electrodes, mild steel flats. Wire brush, Tongs, Chipping hammer etc.

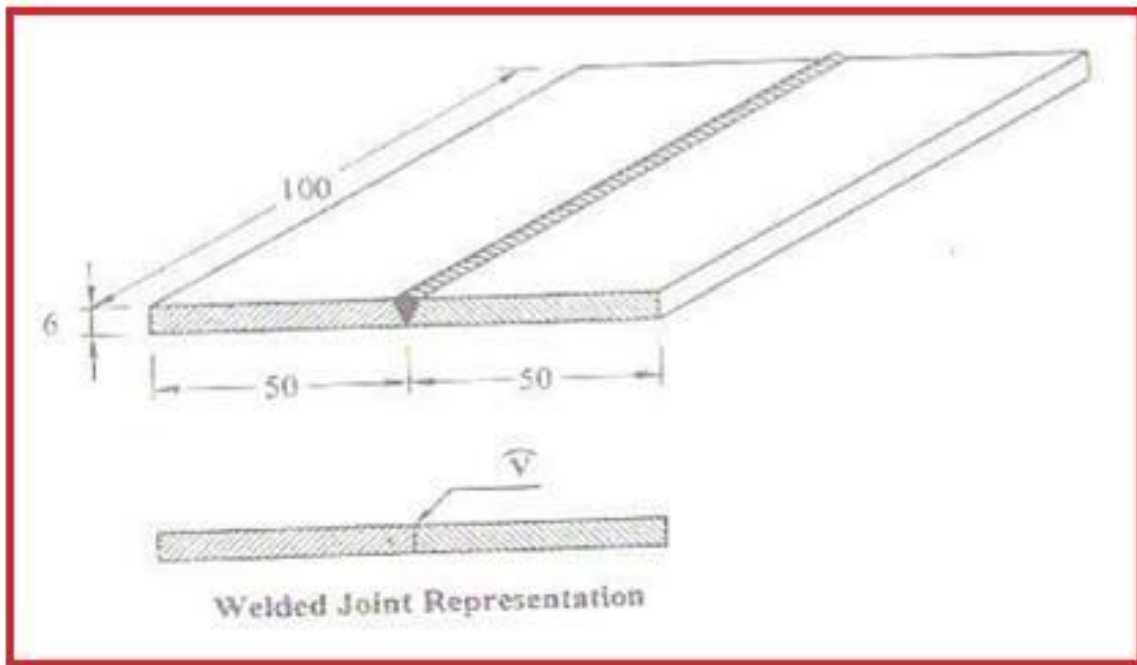
Procedure: -

1. Clean the mild steel flats to be joined by wire brush
2. Arrange the flat pieces properly providing the gap for full penetration for butt joint (gap $\frac{1}{2}$ thicknesses of flats).
3. Practice striking of arc, speed and arc length control.
4. Set the welding current, voltage according to the type of metal to be joined.
5. Strike the arc and make tacks at the both ends to hold the metal pieces together during the welding process
6. Lay beads along the joint maintaining proper speed and arc length (Speed 100-150 mm/min).
7. Clean the welded zone and submit.

Work Pieces:



RESULTS:



VIVA QUESTIONS

1. Which is the welding process you have carried out in workshop?
2. What is Welding?
3. Name the types of welding?
4. Name the welding tools used in workshop?
5. Which outer cover is on the welding rod?
6. Name some of the arc welded joints?
7. What is the difference between electrode and filler rod?
8. What is arc welding?
9. What distance should be maintained between the work and electrode?
10. What is the arc temperature?
11. What is the function of coating in coated electrodes in metal arc welding?
12. What is the output range of voltage and current on the metal arc welding?
13. What will happen if the arc length is reduced while welding?

EX.NO: 5.2 DOUBLE LAP JOINT WITH ARC WELDING**DATE:** _____

Aim: To make a double lap joint, using the given mild steel pieces and by arc welding

Material used:

Two mild steel pieces of 100 X 40 X 6 mm

Tools and equipment used:

1. Arc welding machine,
2. Mild steel electrodes,

3. Electrode holder,
4. Ground clamp,
5. flat nose Tong,
6. Face shield,
7. Apron,
8. Hand gloves,
9. Metallic work Table,
10. Bench vice,
11. Rough flat file,
12. Try square,
13. Steel rule,
14. Wire brush,
15. Ball peen-hammer,
16. Chipping hammer

Operations to be carried out:

1. Cleaning the work pieces
2. Tack welding
3. Full welding
4. Cooling
5. Chipping
6. Finishing

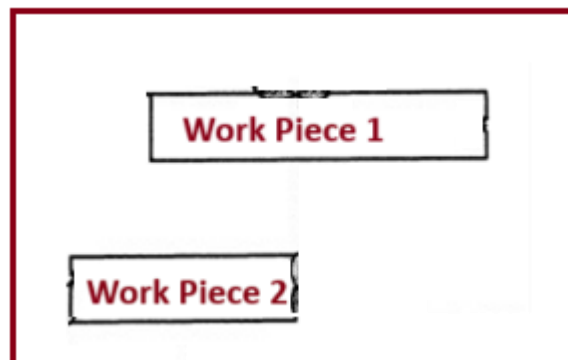
Diagram for Specimens :

Fig:Work piece

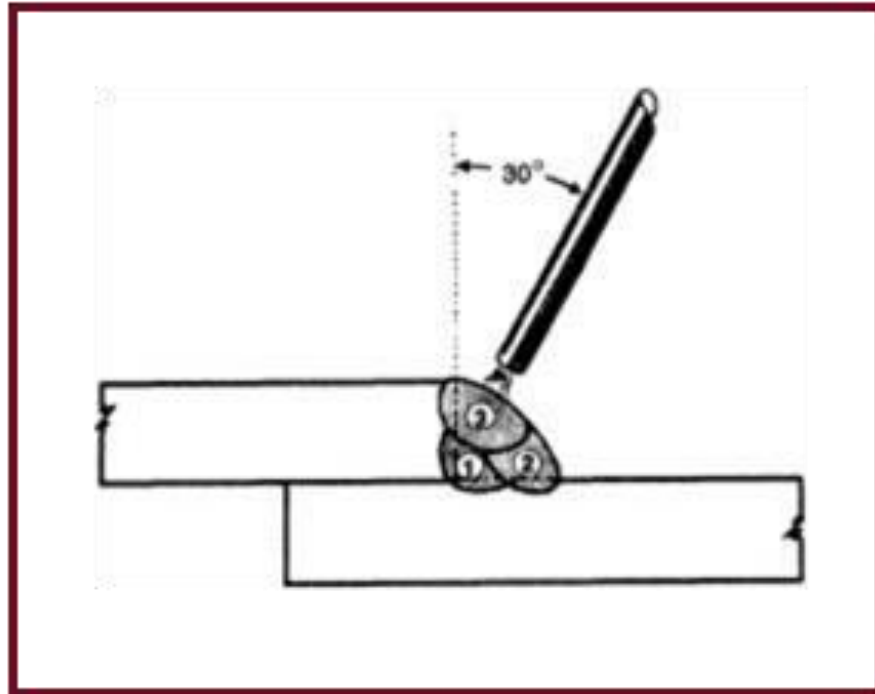
Procedure :

- 1) Take the two mild steel pieces of given dimensions and clean the surfaces thoroughly from rust, dust particles, oil and grease.
- 2) Remove the sharp corners and burrs by filing or grinding and prepare the work pieces.
- 3) The work pieces are positioned on the welding table, to form a lap joint with the required over lapping
- 4) The electrode is fitted in to the electrode holder and the welding current is set to a proper value.
- 5) The ground clamp is fastened to the welding table.
- 6) Wearing the apron, hand gloves, using the face shield and holding the over lapped pieces the arc is struck and the work pieces are tack_welded at the ends of both the sides.
- 7) The alignment of the lap joint is checked and the tack_welded pieces are reset, if required.
- 8) Welding is then carried out throughout the length of the lap joint, on both the sides.
- 9) Remove the slag, spatters and clean the joint.

Precautions:

1. Use goggles, gloves in order to protect the human body.
2. Maintain the constant arc length.

RESULTS:



VIVA QUESTIONS

1. Which is the welding process you have carried out in workshop?
2. What is Welding?
3. Name the types of welding?
4. Name the welding tools used in workshop?
5. Which outer cover is on the welding rod?
6. Name some of the arc welded joints?
7. What is the difference between electrode and filler rod?
8. What is arc welding?
9. What distance should be maintained between the work and electrode?
10. What is the arc temperature?
11. What is the function of coating in coated electrodes in metal arc welding?
12. What is the output range of voltage and current on the metal arc welding?
13. What will happen if the arc length is reduced while welding?

EX.NO: 6.1 J -SHAPE**DATE:** _____

Aim: To make a J-shape from a given round rod, by following hand forging operation

Tools required:

Smith's forge, Anvil, 500gm and I kg ball-peen hammers, Flatters, Swage block, Half round tongs, Pick-up tongs, Cold chisel.

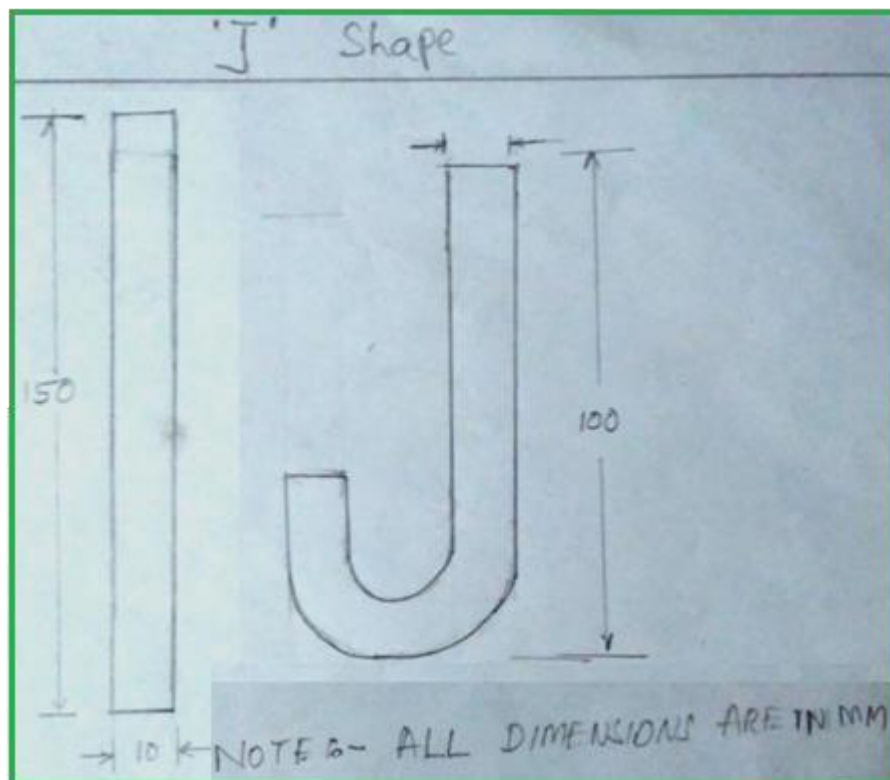
SEQUENCE OF OPERATIONS:

1. One end of the bar is heated to red hot condition in the smith's forge for the required length.
2. Using the pick-up tongs; the rod is taken from the forge, and holding it with the half round tongs, the heated end is forged into a tapered pointed end.
3. The length of the rod requires for J shape is estimated and the excess portion is cut- off, using a cold chisel.
4. One half of the rod towards the pointed end is heated in the forge to red hot condition and then bent into circular shape as shown.
5. The other end of the rod is then heated and forged into a tapered pointed end.
6. The straight portion of the rod is finally heated and bent into circular shape as required.
7. Using the flatter, the J shape made as above, is kept on the anvil and flattened so that, the shape of the J is proper.

NOTE: In-between the above stage, the bar is heated in the smith's forge, to facilitate forging operations.

Precautions:

1. Hold the job carefully while heating and hammering
2. Job must be held parallel to the face of the anvil.
3. Wear steel-toed shoes.
4. Wear face shield when hammering the hot metal
5. Use correct size and type of tongs to fit the work.

Results:**VIVA QUESTIONS**

- Q.1 Name the types of furnace?
- Q.2 Name the tools used in smithy shop?
- Q.3 Why furnace is used in our workshop?
- Q.4 Which type of furnace is used in our workshop?

Q.5 What is use of anvil & swage block?

EX.NO. 6.2 S - HOOK**DATE:** _____

Aim: To make an S-hook from a given round rod, by following hand forging operation

Tools required:

Smith's forge, Anvil, 500gm and I kg ball-peen hammers, Flatters, Swage block, Half round tongs, Pick-up tongs, Cold chisel.

SEQUENCE OF OPERATIONS:

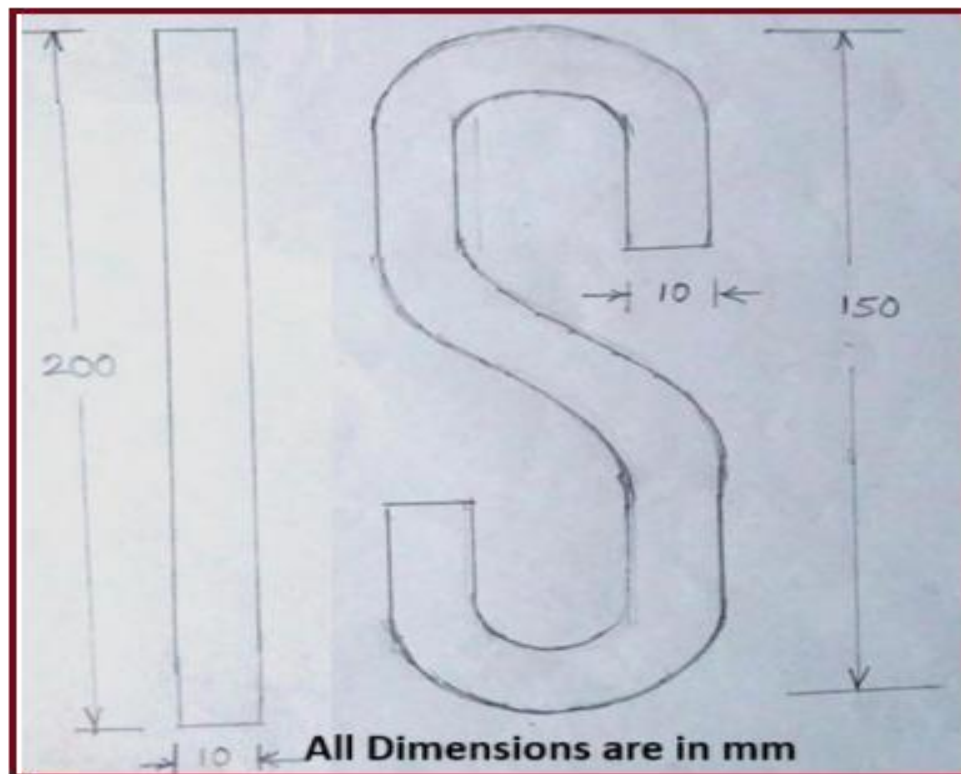
- 1) One end of the bar is heated to red hot condition in the smith's forge for the required length.
- 2) Using the pick-up tongs; the rod is taken from the forge, and holding it with the half round tongs, the heated end is forged into a tapered pointed end.
- 3) The length of the rod requires for S-hook is estimated and the excess portion is cut-off, using a cold chisel.
- 4) One half of the rod towards the pointed end is heated in the forge to red hot condition and then bent into circular shape as shown.
- 5) The other end of the rod is then heated and forged into a tapered pointed end.
- 6) The straight portion of the rod is finally heated and bent into circular shape as required.
- 7) Using the flatter, the S-hook made as above, is kept on the anvil and flattened so that, the shape of the hook is proper.

NOTE: In-between the above stage, the bar is heated in the smith's forge, to facilitate forging operations.

Precautions:

- 1) Hold the job carefully while heating and hammering
- 2) Job must be held parallel to the face of the anvil.
- 3) Wear steel-toed shoes.
- 4) Wear face shield when hammering the hot metal
- 5) Use correct size and type of tongs to fit the work.

Results:



VIVA QUESTIONS

Q.1 Name the types of furnace?

Q.2 Name the tools used in smithy shop?

Q.3 Why furnace is used in our workshop?

Q.4 Which type of furnace is used in our workshop?

Q.5 What is use of anvil & swage block?