ENGINEERING WORKSHOP

(20A03202)

LAB MANUAL

I – B.TECH

Prepared by

Department of Mechanical Engineering

VEMU INSTITUTE OF TECHNOLOGY

(Approved by AICTE, New Delhi and Affiliated to JNTUA, Ananthapuramu)
Accredited by NAAC, NBA (EEE , ECE & CSE) & ISO 9001-2015 Certified Institution
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Chittoor, Andhra Pradesh -517112
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R20 Regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTAPUR – 515 002 (A.P) INDIA

Course Code	IT Workshop	L	T	P	C
20A05202P		0	0	3	1.5

Course Objectives

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course outcomes (CO) : After completion of the course, the student can able to

CO-1: Apply wood working skills in real world applications

CO-2: Build different objects with metal sheets in real world applications

CO-3: Apply fitting operations in various applications.

CO-4: Apply different types of basic electric circuit connections

CO-5: Use soldering and brazing techniques.

LIST OF EXPERIMENTS

1. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints
   a) Half – Lap joint
   b) Mortise and Tenon joint
   c) Corner Dovetail joint or Bridle joint
2. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets
   a) Tapered tray
   b) Conical funnel
   c) Elbow pipe
   d) Brazing
3. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises
   a) V-fit
   b) Dovetail fit
   c) Semi-circular fit
   d) Bicycle tire puncture and change of two wheeler tyre
4. **Electrical Wiring:** Familiarities with different types of basic electrical circuits and make the following connections
   a) Parallel and series
   b) Two way switch
   c) Go down lighting
   d) Tube light
   e) Three phase motor
   f) Soldering of wires

VEMU INSTITUTE OF TECHNOLOGY::P.KOTHAKOTA

NEAR PAKALA, CHITTOOR-517112

(Approved by AICTE, New Delhi & Affiliated to JNTUA, Anantapuramu)

DEPARTMENT OF MECHANICAL ENGINEERING

Engineering Workshop Lab Manual

Name: _____

Reg. No: _____

Year/Semester: _____

_____

VISION OF THE DEPARTMENT

- To become a Centre of excellence in the field of Mechanical Engineering by producing graduates with technical knowledge, research, consultancy and entrepreneurial skills along with leadership qualities, ethics and lifelong learning to cater the needs of the society.

MISSION OF THE DEPARTMENT

- To impart quality education and training to nurture globally competitive mechanical engineers by effective teaching-learning practices and state-of-the art laboratories through eminent faculty.

- To establish linkages with industries and research organizations to bring excellence in problem solving skills, research and consultancy services.

- To empower the graduates with creative thinking, leadership qualities, lifelong learning skills, spirit of entrepreneurship, social and ethical values by offering value based education.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

PO_1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO_2	**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.
PO_3	**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.
PO_4	**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.
PO_5	**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.
PO_6	**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.
PO_7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO_8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO_9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO_10	**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 instructions.
PO_11	**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.
PO_12	**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 Outcomes (PSOs)

A Graduate of the Mechanical Engineering Program will be able to:

S. No.	After graduation, the students will able to:
PSO_1	**Higher Education:** Apply the fundamental knowledge of mathematics, science, and Mechanical Engineering to pursue higher education in the areas of Design, Thermal and Manufacturing Engineering.
PSO_2	**Employment:** Get employed in core and allied industries through their proficiency in the program-specific domain knowledge, specialized computational package and programming or become an entrepreneur.

Programme Educational Objectives (PEOs)

PEO-1: To plan, design, construct, maintain and improve mechanical engineering systems that are technically sound, economically feasible and socially acceptable.

PEO-2: To apply modern computational, analytical, simulation tools and techniques to address the challenges faced in mechanical and allied engineering industries.

PEO-3: To communicate effectively by using innovative tools, demonstrate leadership qualities, research & entrepreneurial skills, exhibit professionalism, ethical attitude, team spirit along with lifelong learning to achieve career and organizational goals.

Course Outcomes:

After completion of this lab the student will be able to

1. Apply wood working skills in real world applications.
2. Build different parts with metal sheets in real world applications.
3. Apply fitting operations in various applications.
4. Apply different types of basic electric circuit connections.
5. Demonstrate soldering and brazing.

ENGINEERING WORKSHOP (20A03202)
(Common to all branches)

Course Objective:

To familiarize students with wood working, sheet metal operations, fitting and electrical housewiring skills

Course Outcomes:

After completion of this lab the student will be able to

1. Apply wood working skills in real world applications. (L3)
2. Build different parts with metal sheets in real world applications. (L3)
3. Apply fitting operations in various applications. (L3)
4. Apply different types of basic electric circuit connections. (L3)
5. Demonstrate soldering and brazing. (L2)

Wood Working:

Familiarity with different types of woods and tools used in wood working and make followingjoints

a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of followingsheet metal job from GI sheets

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two wheelertyre

Electrical Wiring:

Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series b) Two way switch c) Go down lighting d) Tube light e) Three phase motor

f) Soldering of wires

LIST OF EXPERIMENTS

WOOD WORKING

1. Half – Lap joint
2. Mortise and Tenon joint
3. Corner Dovetail joint or Bridle joint

SHEET METAL WORKING

1. Tapered tray
2. Conical funnel
3. Elbow pipe
4. Brazing

FITTING

1. V-fit
2. Dovetail fit
3. Semi-circular fit
4. Bicycle tire puncture and change of two wheeler tyre

5. ELECTRICAL WIRING

1. Parallel and series
2. Two way switch
3. Go down lighting
4. Tube light
5. Three phase motor
6. Soldering of wires

INDEX

S.No	NAME OF THE EXPERIMENT	Date	Page No	Signature of the faculty

WOOD WORKING

INTRODUCTI O

Wood work or carpentry deals with making joints for a variety of applications like door frames, cabinet making furniture, packing etc.,

Timber:

Timber is a name obtained from well grown plants or trees. The timber must cut in such a way that the grains run parallel to the length. The common defects in timber are knots, wet rot, dry rotetc.,

Market sizes of timber:

-

Timber is sold in market in various standard shapes and sizes.They are:-

Log:-

The trunk of a tree, which is free from branches.

Balk:-

The log sawn to have roughly square crosssection.

Post:-

A timber piece, round or square in cross section with more than 275 mm in width,50 to 150 mm in thickness and 2.5 to 6.5 mts length.

Board:-

A sawn timber piece, below 175 mm in width and 30 mm to 50 mm inthickness.

Reapers:-

Sawn timber pieces of assorted and nonstandard sizes, which don't conform tothe above shapes.

WORK HOLDING TOOLS:

Carpentry vice:-

It is a work holding device. When handle vice is turned in a clockwise direction,the sliding jar forces the work against the fixed sawn. The greater the force appliedto the handle, the tighter to the work held.

Bar clamp:-

It is a rectangular (or) square block with V-groove on one or both sides oppositeto each other. It holds cylindrical work pieces.

C-Clamp:-

This is used to hold work against an angle plate or V-block.

MARKING AND MEASURING TOOLS:

Try square:-

It is used for marking and testing the squareness of planed surfaces. It consists of a steel blade, fitted in a cast iron stock. It is also used for flatness. The size of a try square used for varies from 150 mm to 300 mm, according to the length of the blade. It is less accurate when compared to the try square used in fitting shop.

Marking gauge:-

It is a tool used to mark lines parallel to the edges of wooden pieces. It consists of a square wooden stem with a riding wooden stock on it. A marking pin, made of steel is fitted on the stem. A mortise gauge consists of two pins. In these it is possible to adjust the distance between the pins, to draw two parallel lines on thestock.

Fig : 1 steel rule

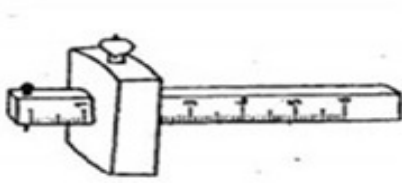


fig: 2 marking Gauge

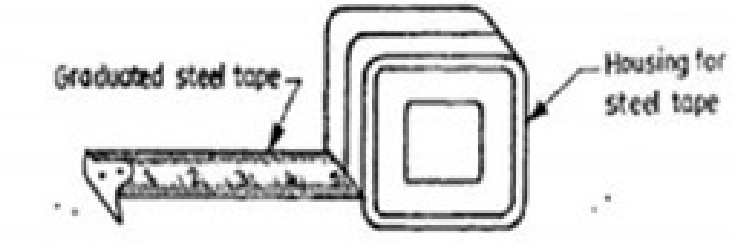


Fig: 3 steel tape

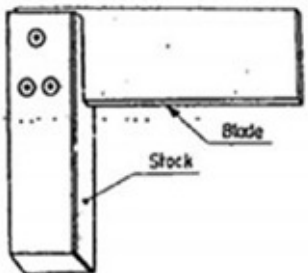


fig: 4 Try square

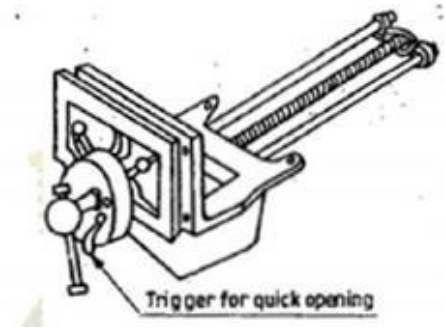


Fig: 5 corpenter vice

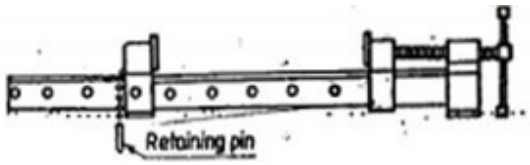


Fig: 6 Bar clamp

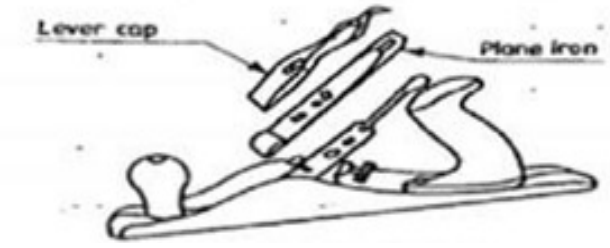


Fig: 7 metal jack plane

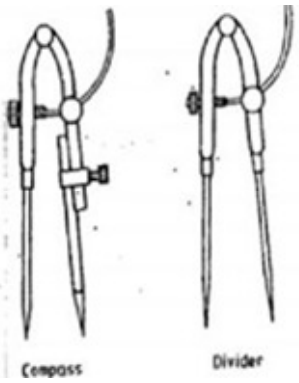


Fig: 8 compass and divider

Compass and dividers:
This is used for marking circles, arcs, laying out perpendicular lines on the planedsurface of the wood.

CUTTING TOOLS:

Hack saw:-
It is used to cross cut the grains of the stock. The teeth are so set that the sawkerfs will be wider than the blade thickness. Hard blades are used to cut hard metals. Flexibleblades are having the teeth of hardened and rest of the blade is soft and flexible. **Chisels:-**
These are used for removing surplus wood. Chisels are annealed, hardened andtempered to produce a tough shank and a hard cutting edge.

Rip saw:-
It is used for cutting the stock along the grains. The cutting edge of this saw makesa sleeper angle about 60o whereas that saw makes an angle of 45o with the surface ofthe stock.

Tenon saw:
It is used for cutting tenons and in fine cabinet works. The blade of this saw is very thin and so it is used stiffed with back strip. Hence, this is sometimes calledback saw. The teeth shapes similar to cross cutsaw.

DRILLING AND BORING TOOLS:

Auger bit:-
It is the most common tool used for boring holes with hardpressure.

Gimlet:-
This is a hand tool used for boring holes with handpressure.

Hand drill:-
Carpenters brace is used to make relatively large size holes, whereas hand drill isused for drilling small holes. A straight shank drill is used with these tools. It is small light in weight and may be conveniently used than the brace. The drill is clamped in the chuck.

MISCELLANEOUS TOOLS:

Ball peen hammer:-
It has a flat face, which is used for general work and a ball end is used for riveting.**Mallet:-**
It is used to drive the chisel, when considerable force is to be applied, steel hammer should not be used for these purpose, as it may damage the chisel handle. Further, for better to apply a series of light taps with the mallet rather than a heavy single blow.

Claw hammer:-
It is a striking flat at one end and the claw at the others. The face issued to drive nails into wood and for other striking purpose and the claw for extracting nails out of wood.

Pinches:-
It is made of steel with a hinged and is used for pulling out small nails from wood.

Wood rasp file:-
It is a finishing tool used to make the wood smooth, remove sharp edge finishing fillets and other interior surfaces. Sharp cutting teeth are provided on its surfacefor the purpose. This file is exclusively used in wood work.

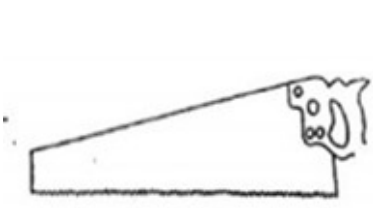


Fig: 9 cross cut saw

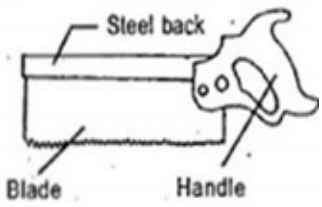


Fig: 10 Tenon saw

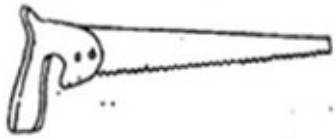


Fig: 11 compass saw

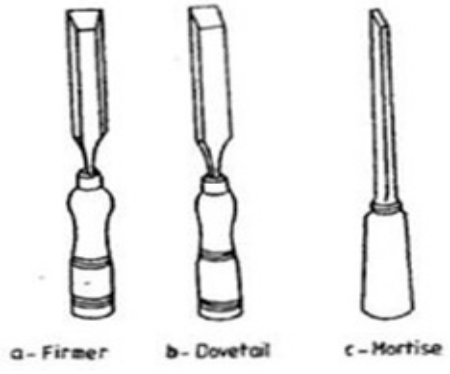


Fig: 12 Chisels

Fig: 13 Carpenter's brace

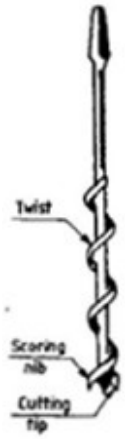


Fig: 14 Auger bit

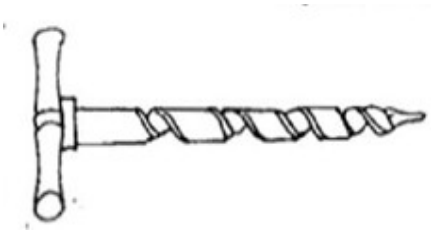


Fig: 15 Gimlet

Fig: 16 wood rasp file

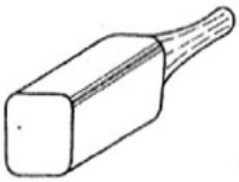


Fig: 17 Mallet

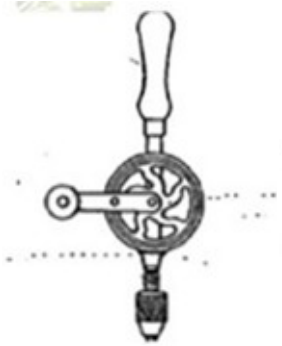


Fig: 18 Hand drill

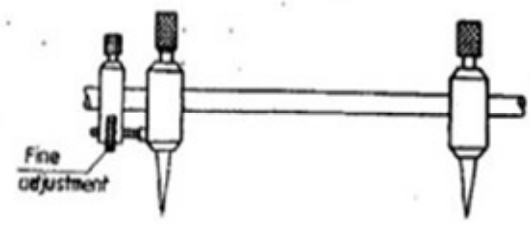


Fig: 19 Trammel

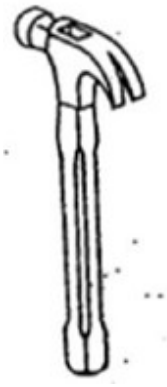


Fig: 20 Claw hammer

HALF-LAP JOINT

EXPERIMENT NO: **DATE:**

Aim: - To make a Half- lap joint.

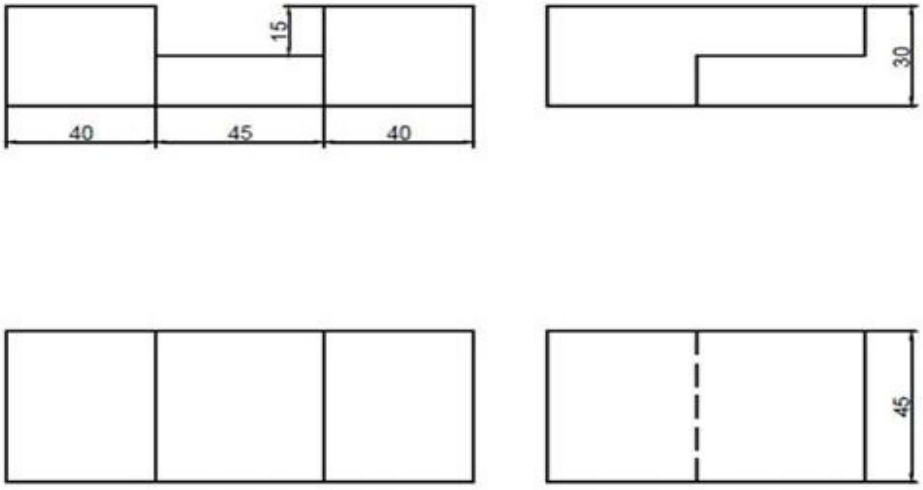
Tools required: -

1. Carpenter's vice
2. Steel Rule
3. Try square
4. Jack plane
5. Scriber
6. Cross cut saw
7. Marking gauge
8. Firmer chisel
9. Mallet
10. Wood rasp file and smooth file

Material required: - Wooden pieces of size 50 x 35 x 250 mm–2 Nos.

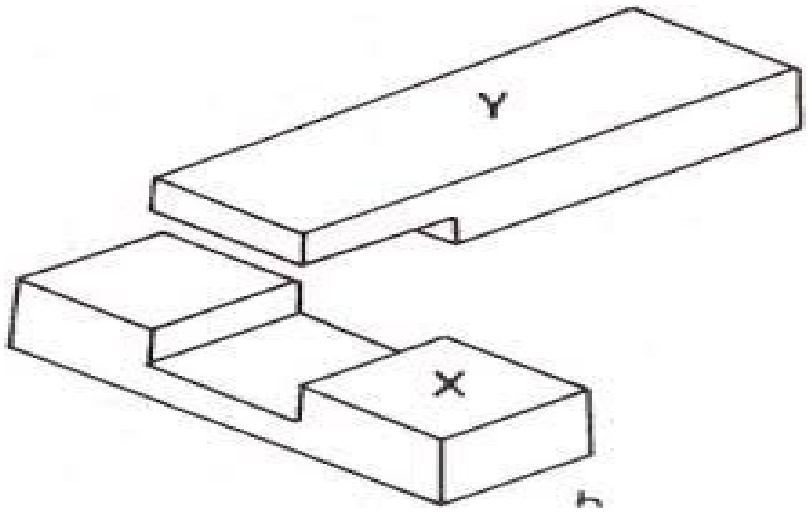
Sequence of operations: -

1. Measuring and Marking
2. Planning
3. Check for squareness
4. Removal of extra material
5. Sawing
6. Chiseling
7. Finishing



T-LAP JOINT

ALL DIMENTIONS ARE IN MM



Procedure: -

1. The given reaper is checked for dimensions.
2. They are planed with jack plane and checked for straightness.
3. The two surfaces are checked for squareness with a try square.
4. Marking gauge is set and lines are marked at 30 and 45 mm to mark thethickness and width of the model respectively.
5. The excess material is first chiseled with firmer and then planned tocorrect size.
6. The mating dimensions of the parts X and Y are then marked using steel rule and marking gauge.
7. Using the crosscut saw, the portions to be removed are cut in both thepieces, followed by chiseling.
8. The ends of both the parts are chiseled to the exact lengths.
9. The fine finishing is given to the parts, if required so that, properfitting is obtained.
10. The parts are fitted to obtain a slightly tight joint.

Safety precautions: -

1. Loose cloths are to be avoided.
2. Tools to be placed at their proper placed.
3. Hands should not be placed in front of sharp edged tools.
4. Use only sharp tools.
5. Care should be taken, when thumb is used as a guide in crosscutting and ripping.
6. Handle while chiseling, sawing and planning with care.

Result: - Half- lap joint is made as per the required dimensions.

MORTISE AND TENON JOINT

EXPERIMENT NO: **DATE:**

Aim: - To make a Mortise and Tenon joint.

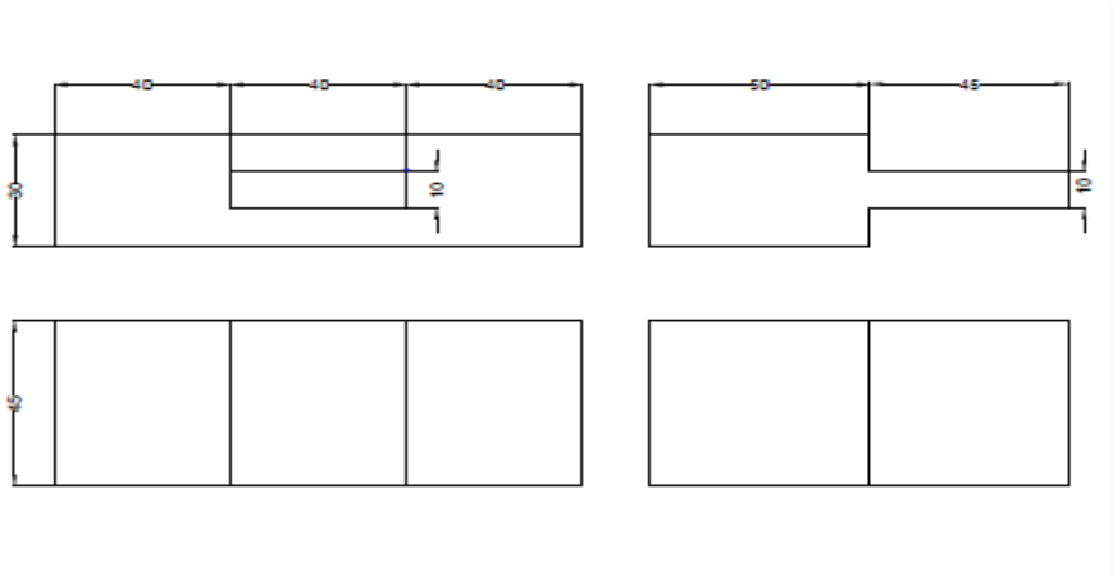
Tools required: -

1. Carpenter's vice
2. Steel Rule
3. Try square
4. Jack plane
5. Scriber
6. Cross cut saw
7. Marking gauge
8. Firmer chisel
9. Mallet
10. Wood rasp file and smooth file

Material required: - Wooden pieces of size 50 x 35 x 250 mm–2 Nos.

Sequence of operations: -

1. Measuring and Marking
2. Planning
3. Check for squareness
4. Removal of extra material
5. Sawing
6. Chiseling
7. Finishing



ALL DIMENSIONS ARE IN MM

Procedure: -

1. The given reaper is checked for dimensions.
2. They are planed with jack plane and checked for straightness.
3. The two surfaces are checked for squareness with a try square.
4. Marking gauge is set and lines are marked at 30 and 45 mm to mark thethickness and width of the model respectively.
5. The excess material is first chiseled with firmer and then planned tocorrect size.
6. The mating dimensions of the parts X and Y are then marked using steelrule and marking gauge.
7. Using the crosscut saw, the portions to be removed are cut in both thepieces, followed by chiseling.
8. The ends of both the parts are chiseled to the exact lengths.
9. The fine finishing is given to the parts, if required so that, proper fittingis obtained.
10. The parts are fitted to obtain a slightly tight joint.

Safety precautions: -

1. Loose cloths are to be avoided.
2. Tools to be placed at their proper placed.
3. Hands should not be placed in front of sharp edged tools.
4. Use only sharp tools.
5. Care should be taken, when thumb is used as a guide in cross cuttingand ripping.
6. Handle while chiseling, sawing and planning with care.

Result: - Mortise and Tenon joint is made as per the required dimensions.

CORNER BRIDLE JOINT

EXPERIMENT NO: **DATE:**

Aim: - To make a Corner Bridle joint.

Tools required: -

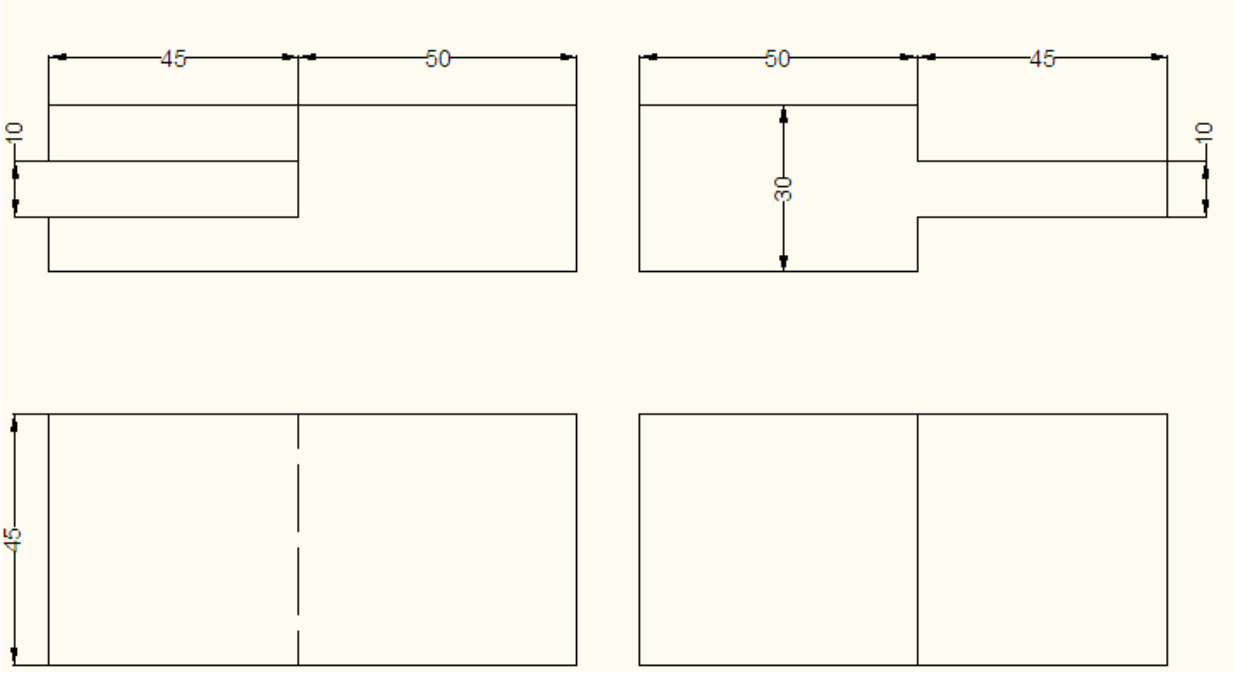
1. Carpenter's vice
2. Steel Rule
3. Try square
4. Jack plane
5. Scriber
6. Cross cut saw
7. Marking gauge
8. Firmer chisel
9. Mallet
10. Wood rasp file and smooth file

Material required: - Wooden pieces of size 50 x 35 x 250 mm–2 Nos.

Sequence of operations: -

1. Measuring and Marking
2. Planning
3. Check for squareness
4. Removal of extra material
5. Sawing
6. Chiseling
7. Finishing

CORNER BRIDLE JOINT



ALL DIMENSIONS ARE IN MM

Procedure: -

1. The given reaper is checked for dimensions.
2. They are planed with jack plane and checked for straightness.
3. The two surfaces are checked for squareness with a try square.
4. Marking gauge is set and lines are marked at 30 and 45 mm to mark the thickness and width of the model respectively.
5. The excess material is first chiseled with firmer and then planned tocorrect size.
6. The mating dimensions of the parts X and Y are then marked using steelrule and marking gauge.
7. Using the crosscut saw, the portions to be removed are cut in both thepieces, followed by chiseling.
8. The ends of both the parts are chiseled to the exact lengths.
9. The fine finishing is given to the parts, if required so that, properfitting is obtained.
10. The parts are fitted to obtain a slightly tight joint.

Safety precautions: -

1. Loose cloths are to be avoided.
2. Tools to be placed at their proper placed.
3. Hands should not be placed in front of sharp edged tools.
4. Use only sharp tools.
5. Care should be taken, when thumb is used as a guide in crosscutting and ripping.
6. Handle while chiseling, sawing and planning with care.

Result: - Corner Bridle joint is made as per the required dimensions.

SHEET METAL WORKING

INTRODUCTION:

Many engineering and house hold articles such as boxes, cans, funnels, ductsetc., are made from a flat sheet of metals. These process being known as tin smithy. For this, the development of the article is first drawn on the sheet metal then cut and folded to form the required shape of the article. The edge of the articles are then secured through welding, brazing, soldering, rivetingetc.

Sheet metal materials:

A variety of metals used in a sheet metal shop such as black iron, aluminum and stainless steel. A sheet of soft steel which is coated with molten zinc is known as galvanized iron. The zinc coat forms a coating that resists rust, improves the appearance of the metal and permits it to be solderised with greater care.

Hand tools:

The common hand tools used in sheet metals work are steel rule, usually of 60 cm length, Vise gauge, dot punch, scriber, trammels, ball peen hammer, and straight peen hammer, cross peen hammer, mallets, snips and soldering iron.

Trammels:-

Sheet metals layouts require marking of arcs and circles. This may be done by usingthe trammels. The length of the beam decides the maximum size of the arc that canbe scribed.

Wire gauge:-

The thickness of the sheet metal is referred in numbers known as standard wiregauge (SWG). The gaps in the circumstance of the gauge are used to check the gaugenumber.

Bench shears:

Sheet metal may be cut by shearing action. In this the force is applied through a compound lever, making it possible to cut sheet metal up to 4mm thick.The chopping hole can shear a mild steel rod up to 10mm diameter.

Snips:-

Snips are hand shears, varying in length from 200mm to 600mm. 200mm to 250mm being the commonly used. The straight lines are curved snips or bent snips arefor trimming along inside curves.

Hammers:-

Ball peen hammer has a cylindrical slightly curved face and a ball head straight peen and similar to the cross peen, but it is positioned paralleled to the handle which can be used conveniently for certain operations of folding.

Stakes:

-

Stakes are nothing but anvils, which are used as supporting tools and to form seam, bend, rivet sheet metal objects.

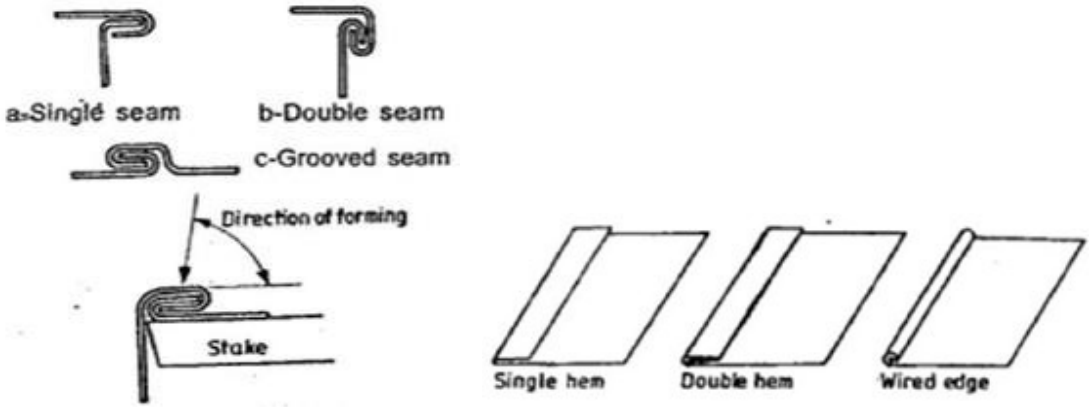
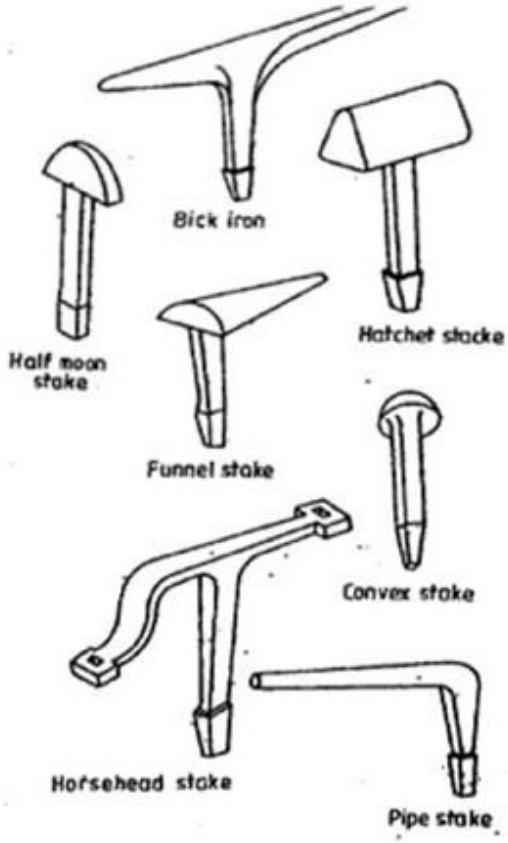


Fig: 1 Sheet metal joints



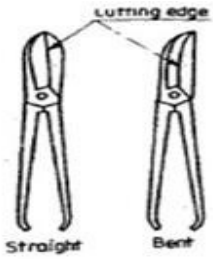


Fig. 10.4 Snips

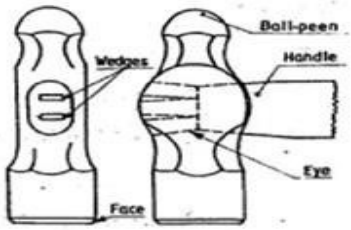


Fig. 8.34 Ball-peen hammer

Table 10.1

SWG No	Thickness, mm
10	3.20
12	2.60
14	2.30
16	1.60
20	1.00
22	0.70
24	0.65
26	0.45
30	0.30

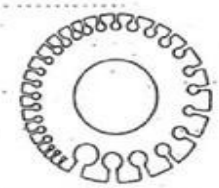


Fig. 10.2 Standard wire gauge

Fig: 2 Stakes

Snips:-
Snips are hand shears, varying in length from 200mm to 600mm. 200mm to 250mm being the commonly used. The straight lines are curved snips or bent snips are for trimming along inside curves.

Hammers:-
Ball peen hammer has a cylindrical slightly curved face and a ball head straight peen and similar to the cross peen, but it is positioned paralleled to the handle which can be used conveniently for certain operations of folding.

Stakes:
-
Stakes are nothing but anvils, which are used as supporting tools and to form seam, bend, rivet sheet metal objects.

SHEET METAL JOINTS:

Various types of joints are used in sheet metal work to suit the varying requirement. These are self-secured joints, formed by joining together two pieces of sheets metal and using the metal itself to form the joints. These joints are to be used on sheets of less than 1.6 mm thickness.

Riveting:-
Rivets are used to fasten two of more sheets of metal together. It is the commonpractice to use the rivets of the same material as that of the sheets having fastened.

Sheet metal screws:-
These are used in sheet metal work to join and install duct work for ventilation air conditioning etc. These screws are also known as self-tapping screws since theycut their own threads.

Soldering:-
Soldering is one method of joining two pieces of metal with an alloy that melts ata lower temperature than the metals to be joined for a good job. The metals to bejoined must be free from dirt, grease and oxide. Solder is made of tin and lead in equal proportions. It comes either in the form of wire and bar.

Soldering iron:-
Soldering requires a source of heating. A common method of transmitting heat ofthe metal surfaces is by using a soldering iron.

TAPERED TRAY

EXPERIMENT NO: **DATE:**

AIM: - To make a tapered tray using the given G.I. Sheet.

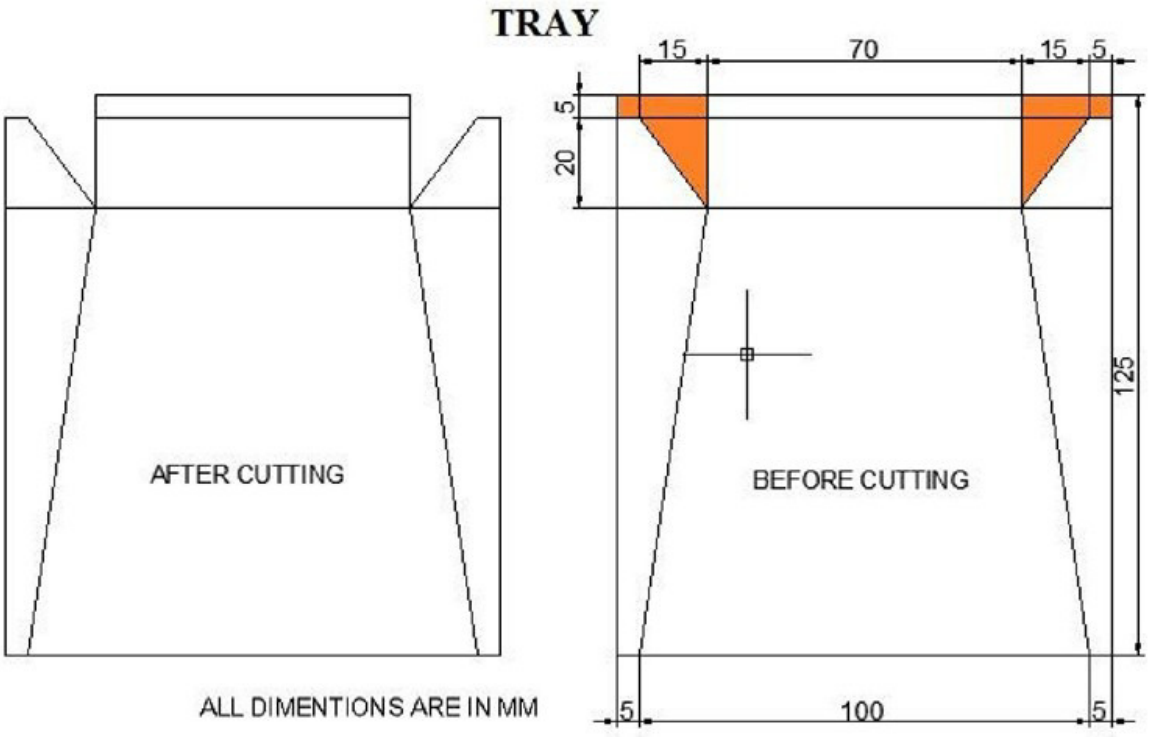
TOOLS REQUIRED: -

1. Steel rule
2. Scriber
3. Straight snip
4. Bench vice
5. Stake
6. Cross peen hammer
7. Wooden mallet
8. Cutting pier

MATERIAL REQUIRED: - Galvanized Iron (G.I) sheet 110 x 125 mm size.

SEQUECE OF OPERATIONS:-

1. Cleaning
2. Surface leveling
3. Marking
4. Cutting
5. Folding


TRAY
AFTER CUTTING
BEFORE CUTTING
ALL DIMENTIONS ARE IN MM
15
70
15
5
5
20
125
5
100
5

PROCEDURE: -

1. Clean the given sheet with cotton waste.
2. The size of the given sheet is checked with the steel rule.
3. Flatten the surface of the given sheet with wooden mallet.
4. Check the G.I. Sheet for dimensions and remove extra material, if any.
5. Mark all the measuring lines on the given sheet with scriber.
6. Cut the given sheet with straight snips as required.
7. Fold the given sheet by using stakes and ball peen hammer to therequired shape.

SAFETY PRECAUTIONS: -

1. For marking purpose use scriber only. Do not use pencil or pen.
2. Sufficient care is to be taken while cutting and folding of G.I. sheet.
3. Remove the waste pieces immediately from the work place.

RESULT: Tapered tray is made as per the required dimensions.

CONICAL FUNNEL

EXPERIMENT NO: **DATE:**

AIM: - To make Conical funnel using the given G.I. Sheet.

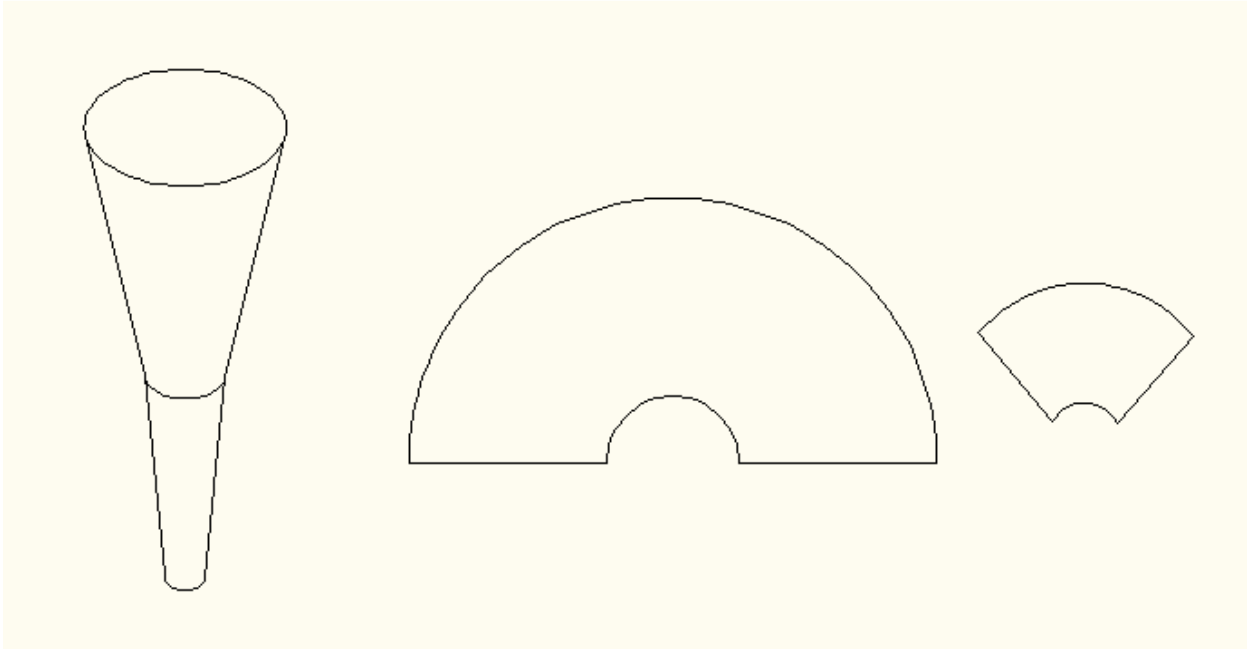
TOOLS REQUIRED: -

1. Steel rule
2. Scriber
3. Straight snip
4. Bench vice
5. Stake
6. Cross peen hammer
7. Wooden mallet
8. Cutting pier

MATERIAL REQUIRED: - Galvanized Iron (G.I) sheet 160 x 80mm size.

SEQUECE OF OPERATIONS:-

1. Cleaning
2. Surface leveling
3. Marking
4. Cutting
5. Folding



FUNNEL DEVELOPEMENT

PROCEDURE: -

1. Clean the given sheet with cotton waste.
2. The size of the given sheet is checked with the steel rule.
3. Flatten the surface of the given sheet with wooden mallet.
4. Check the G.I. Sheet for dimensions and remove extra material, if any.
5. Mark all the measuring lines on the given sheet with scriber.
6. Cut the given sheet with straight snips as required.
7. Fold the given sheet by using stakes and ball peen hammer to the required shape.

SAFETY PRECAUTIONS: -

1. For marking purpose use scriber only. Do not use pencil or pen.
2. Sufficient care is to be taken while cutting and folding of G.I. sheet.
3. Remove the waste pieces immediately from the work place.

RESULT: Conical funnel is made as per the required dimensions.

ELBOW PIPE

EXPERIMENT NO: **DATE:**

AIM: - To make Elbow pipe using the given G.I. Sheet.

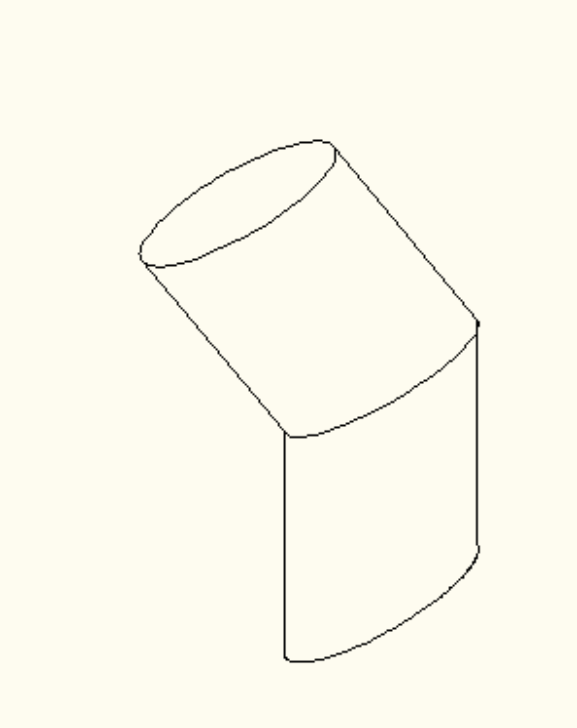
TOOLS REQUIRED: -

1. Steel rule
2. Scriber
3. Straight snip
4. Bench vice
5. Stake
6. Cross peen hammer
7. Wooden mallet
8. Cutting pier

MATERIAL REQUIRED: - Galvanized Iron (G.I) sheet 160 x 80mm size.**SEQUECE OF OPERATIONS:-**

1. Cleaning
2. Surface leveling
3. Marking
4. Cutting
5. Folding

ELBOW



PROCEDURE: -

1. Clean the given sheet with cotton waste.
2. The size of the given sheet is checked with the steel rule.
3. Flatten the surface of the given sheet with wooden mallet.
4. Check the G.I. Sheet for dimensions and remove extra material, if any.
5. Mark all the measuring lines on the given sheet with scriber.
6. Cut the given sheet with straight snips as required.
7. Fold the given sheet by using stakes and ball peen hammer to the required shape.

SAFETY PRECAUTIONS: -

1. For marking purpose use scriber only. Do not use pencil or pen.
2. Sufficient care is to be taken while cutting and folding of G.I. sheet.
3. Remove the waste pieces immediately from the work place.

RESULT: Elbow pipe is made as per the required dimensions.

BRAZING

EXPERIMENT NO: **DATE:**

Brazing: Brazing is defined as the technique of joining two similar or dis-similar materials, by addition of special filler metal. Brazing is also called as hard soldering and it results in a stronger joint than soldering. It can withstand temperatures up to 800°C and higher pressures. The filler metal, i.e. solder used in brazing is known as spelter, a non-ferrous metal or alloy. The following are the stages involved in brazing:

1) Make a tight fitting joint. Where necessary, file a groove along the joint forthe solder to run into.
2) Clean the surface of the joint, free from oil, dirt, grease, rust, etc.
3) Apply flux with a brush
4) Preheat the area until the flux dries out. Then, heat the joint until it is brightred.
5) Apply the solder when it begins to melt; move the torch along the joint forthe solder to flow evenly.
6) Clean, file and smoothen the joint

Advantages:

1. Produce leak-proof joints, which are superior to soldered joints.
2. Produce corrosion resistant joints.
3. Brazing can be performed on similar or dis-similar metals.Disadvantages:
1. Large areas cannot be brazed easily due to the possibility of lack of uniformheating of internal surfaces.
2. Joints have poor strength compared to welded joints.
3. Require tightly mating parts.
4. Brazing fluxes may produce toxic fumes.
5. It cannot be performed on hardened steel.

Precautions: Avoid the inhalation of fumes produced because of fluorides and fluorine compounds that are present in brazing fuses, particularly those used withsilver, magnesium and aluminum silicon brazing filler metals.

FITTING

INTRODUCTION:

Machine tools are capable of producing work at a faster rate, but there are occasions when components are processed at a bench. Sometimes it becomes necessary to replace or repair a component that must fit accurately with one another or reassemble. This involves a certain amount of hand fitting. The assembly machine tools, jigs, gauges etc., involves certain amount of bench work.

FITTING TOOLS:

Holding tools:-

Bench vice
V-block with clamp
C-clamp

Bench vice:-

It is a work holding device, when vice handle is turned in a clockwise direction thesliding jaw forces the work against the fixed jaw, the greater the force applied to the handle, the tighter is the work held.

***V*- block with clamp:-**

It is a rectangular (or) square block with v-groove on one or both sides, opposite to each other. It holds cylindrical work pieces.

C-clamp:-

This is used to hold work against an angle plate or v-block.

MARKING AND MEASURING TOOLS:

1. Surface plate
2. Try square
3. Angle plate
4. Scriber
5. Universal scribing block
6. Odd leg caliper
7. Divider
8. Calipers
9. Dot punch
10. Vernier caliper

Surface plate:-

It is used for testing flatness of work piece, for marking out small works.

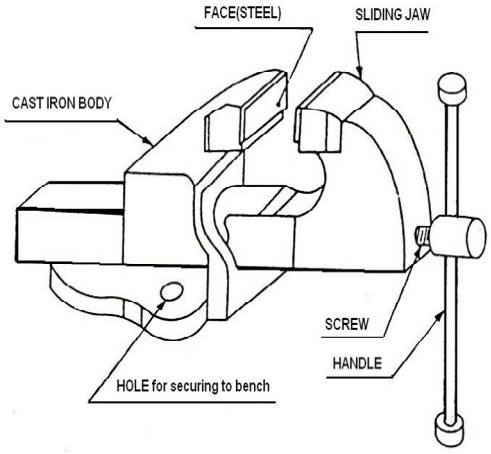


Fig: 1 Bench wise

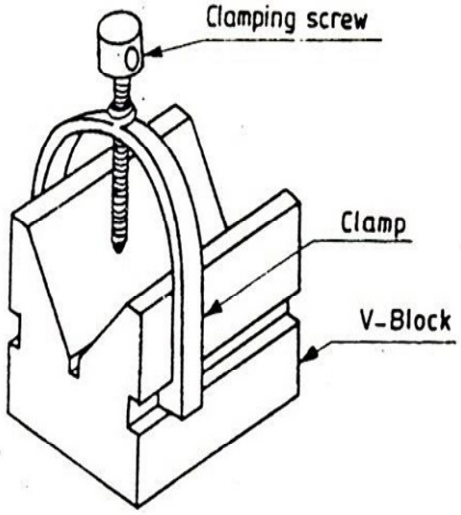


Fig: 2 V- Block

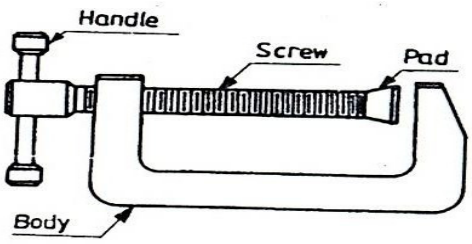


Fig: 3 C – Clamp

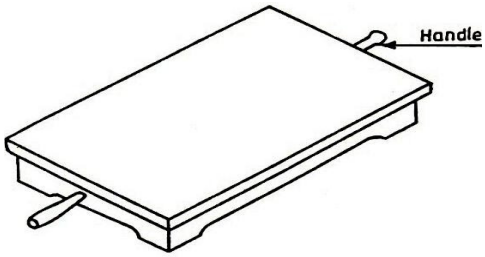


Fig: 4 Surface plate

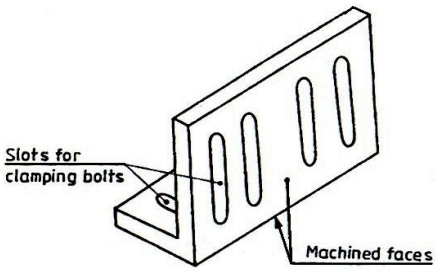


Fig: 5 Angle plate

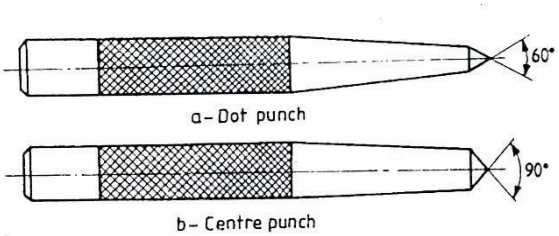


Fig: 6 Dot punch

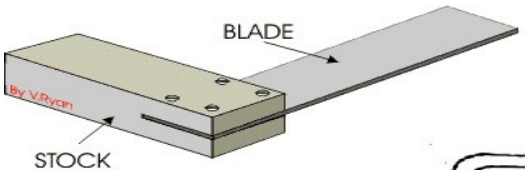


Fig: 6 try square

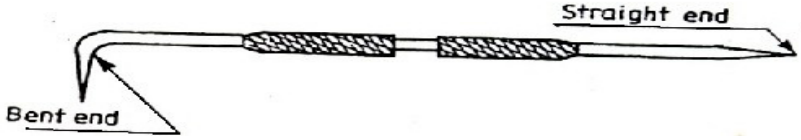


Fig: 7 scriber

Combination cutting pliers: -
This is made of tool steel and is used for cutting as well as for ripping work.
Taps and die holders: -
Tap and wrenches are used for cutting internal threads in a drilled hole.
Dies and die holders:-
They are used for making external threads. Dies are made either solid (or) splittype.

TYPES OF FILES:

Hand file:-
It is a rectangular in section tapered in thickness but parallel in width.
Flat file:-
Rectangular in section and tapered for 1/3rd length in width and thickness.
Square file:-
Square in section and tapered for 1/3rd length on all sides.
Half round file:-
It has one flat face, connecting by a curved (surface) face & tapered for 1/3rdlength.
Round file:-
Circular in cross section and tapered for 1/3rd length, it has double cut teeth.

MISCELLANEOUS TOOLS:

Ball peen hammer:-
It has a flat face, which is used for general work and a ball end is used for riveting.
Screw driver:-
It is designed to turn the screws. The blade is made of steel and is available indifferent lengths and diameters.
Spanners:-
It is a tool for turning nuts and bolts. It is usually made of forged steel.

FITTING OPERATIONS:

Chipping:-
Removing metal with a chisel is called chipping and is normally used wheremachining is not possible.
Fitting:-

1. Pinning of files:-
   Soft metals cause this; the pins are removed with a file card.
2. Checking flatness and square ness:-
   To check flatness across thickness of plate.

MARKING AND MEASURING:

Measurements are taken either from a center line, for visibility of the non-ferrous metals and oxide coated steels are used.

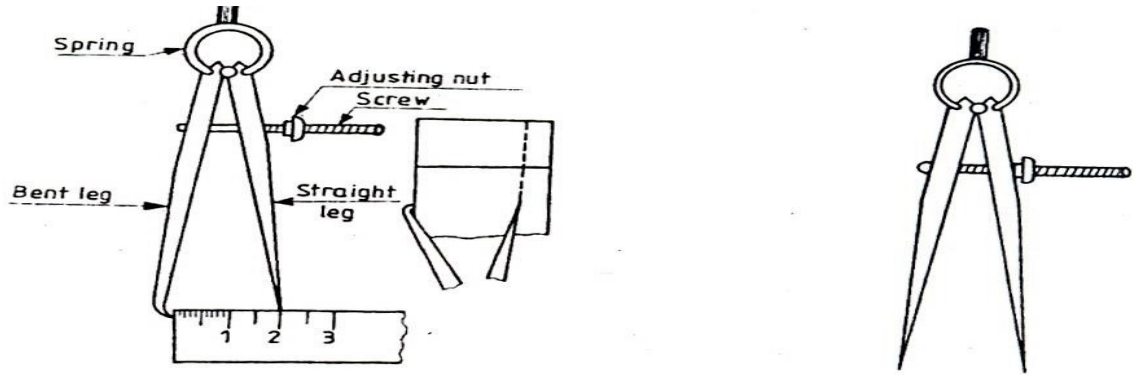


Fig: 8 odd leg clamp and divider

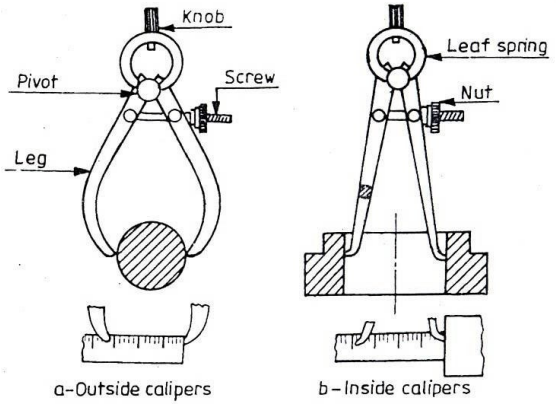


Fig: 9 calipers

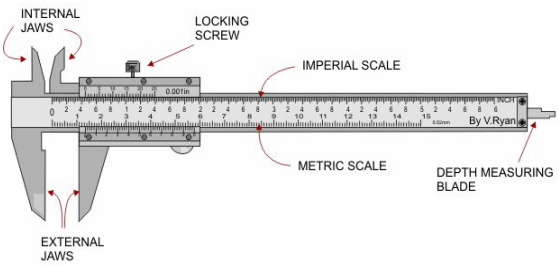


Fig: 10 Vernier caliper

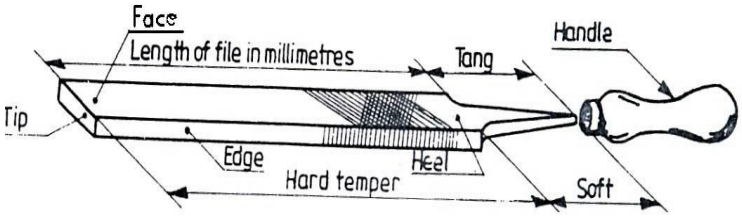


Fig: 11 Parts of hand file

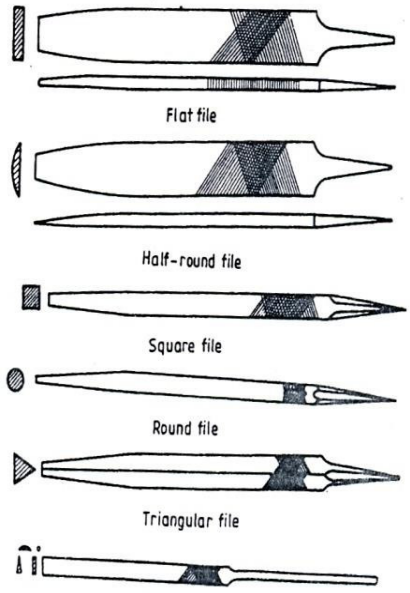


Fig: 12 Types of files

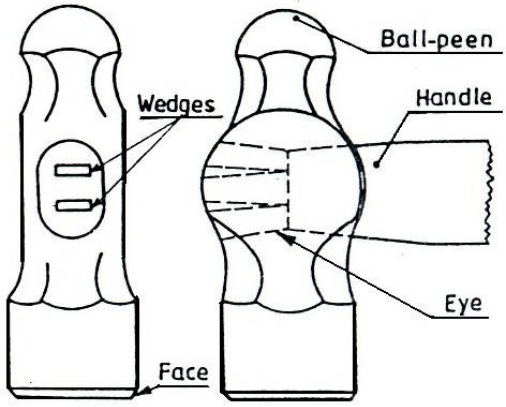


Fig: 13 ball peen hammer

V-FIT

EXPERIMENT NO: **DATE:**

AIM: - To make a V-fit from the given two M.S pieces.

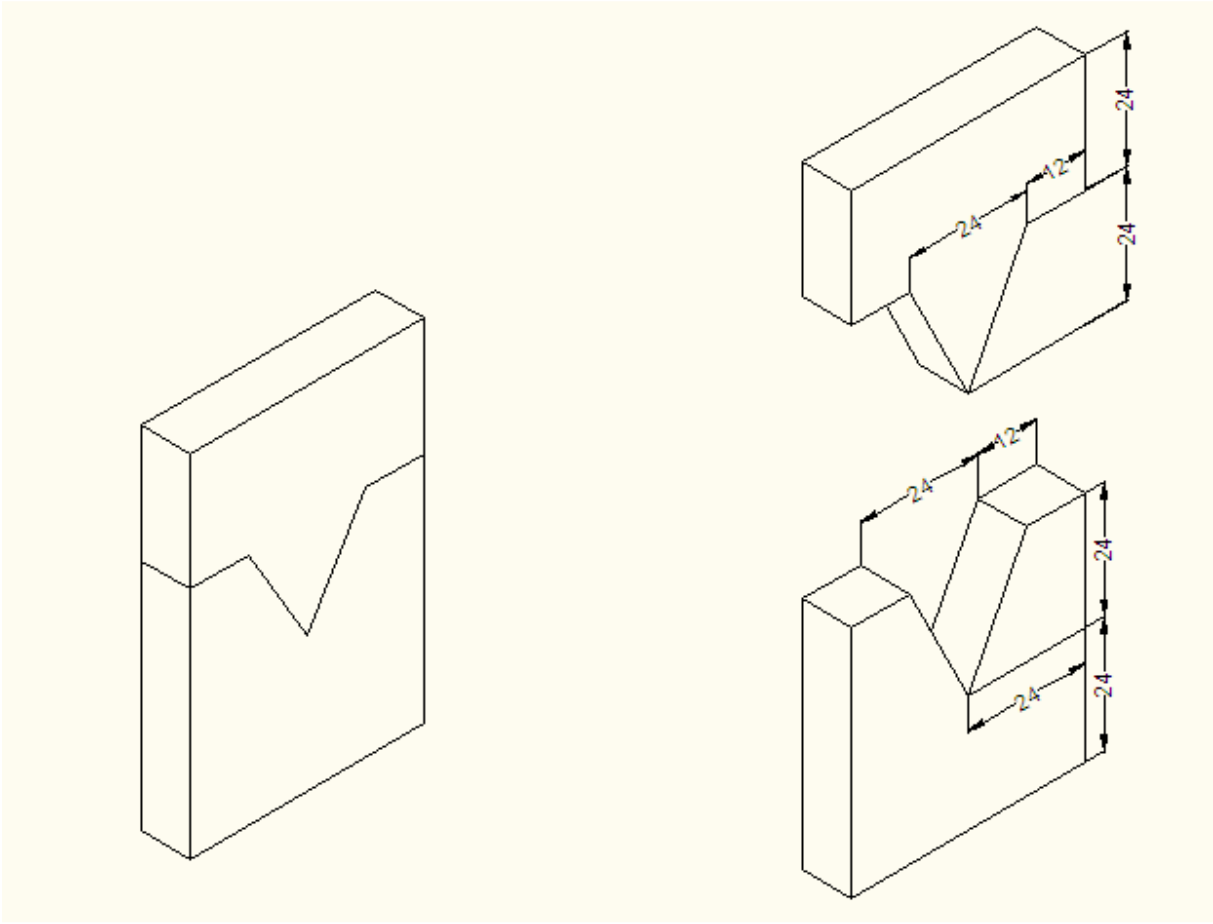
TOOLS REQUIRED: -

1. Bench vice
2. Steel rule
3. Try square
4. Ball peen hammer
5. Scriber
6. Hack saw with blade
7. Dot punch and Centre punch
8. Surface plate
9. Rough and smooth flat files
10. Flat chisel and triangular file

MATERIAL REQUIRED: - Mild steel (M.S) plate of size 48 x 34–2

Nos.**SEQUECE OF OPERATIONS:-**

1. Filing
2. Checking flatness and squareness
3. Marking and measuring
4. Punching
5. Sawing
6. Chipping
7. Finishing



ALL DIMENSIONS ARE IN MM

PROCEDURE: -

1. The burrs in the pieces are removed and the dimensions are checkedwith the steel rule.
2. The pieces are clamped one after the other and the outer mating edgesare filed by using rough and smooth files.
3. The flatness, straightness and squareness i.e. right angle betweenadjacent sides are checked with help of Try-square.
4. Chalk is then applied on the surfaces of the two pieces.
5. The given dimensions of the V-fitting are marked carefully.
6. Using the dot punch, dots are punched along the above scribed lines.
7. Using the hack saw, the unwanted portions are removed.
8. Using the flat chisel, the unwanted material in the piece Y is removed.
9. The cut edges are filed by the half round file.
10. The corners of the stepped surfaces are filed by using a square ortriangular file to get the sharp corners.
11. The pieces (X and Y) are fitted together and the mating is checked forthe correctness of the fit.

SAFETY PRECAUTIONS: -

1. Care is taken to see that the marking dots are not crossed, which is indicated by the half of the punch dots left on the pieces.
2. Apply pressure in forward direction during hack sawing.
3. Don't rub steel rule on the job.
4. Fix blade in hack saw frame with correct tension.
5. During hack sawing the coolant like water or lubricating oil is to be used.
7. Files are to be cleaned properly after using.

RESULT: - The required V-fit is thus obtained as per given dimensions.

DOVETAIL FIT

EXPERIMENT NO: **DATE:**

AIM: - To make a Dovetail fit from the given two M.S pieces.

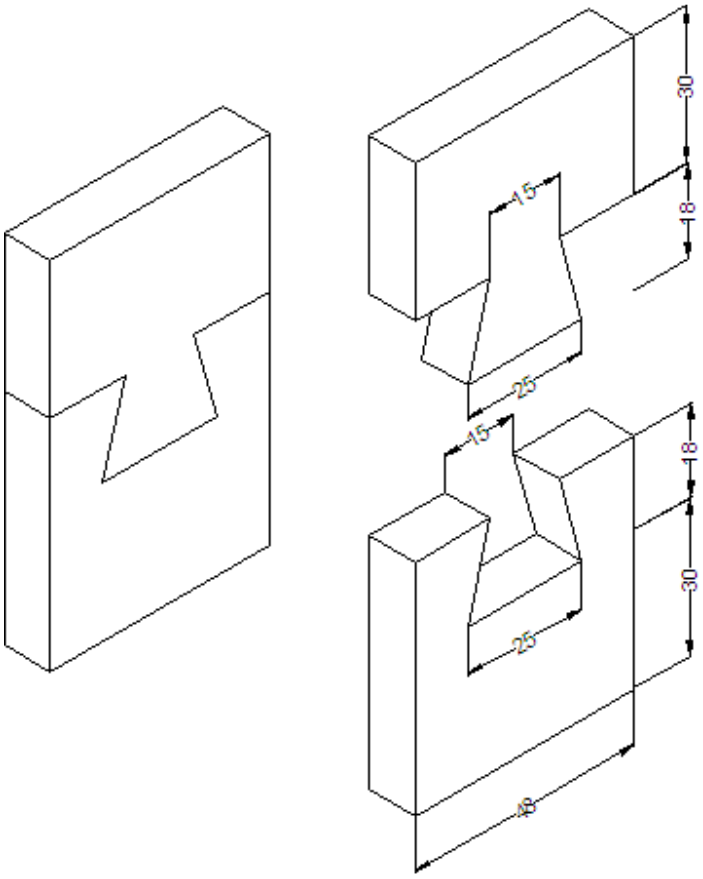
TOOLS REQUIRED: -

1. Bench vice
2. Steel rule
3. Try square
4. Ball peen hammer
5. Scriber
6. Hack saw with blade
7. Dot punch and Centre punch
8. Surface plate
9. Rough and smooth flat files
10. Flat chisel and triangular file

MATERIAL REQUIRED: - Mild steel (M.S) plate of size 48 x 34–2 Nos.

SEQUECE OF OPERATIONS:-

1. Filing
2. Checking flatness and squareness
3. Marking and measuring
4. Punching
5. Sawing
6. Chipping
7. Finishing



ALL DIMENSIONS ARE IN MM

PROCEDURE: -

1. The burrs in the pieces are removed and the dimensions are checkedwith the steel rule.
2. The pieces are clamped one after the other and the outer mating edgesare filed by using rough and smooth files.
3. The flatness, straightness and squareness i.e. right angle betweenadjacent sides are checked with help of Try-square.
4. Chalk is then applied on the surfaces of the two pieces.
5. The given dimensions of the V-fitting are marked carefully.
6. Using the dot punch, dots are punched along the above scribed lines.
7. Using the hack saw, the unwanted portions are removed.
8. Using the flat chisel, the unwanted material in the piece Y is removed.
9. The cut edges are filed by the half round file.
10. The corners of the stepped surfaces are filed by using a square ortriangular file to get the sharp corners.
11. The pieces (X and Y) are fitted together and the mating is checked forthe correctness of the fit.

SAFETY PRECAUTIONS: -

1. Care is taken to see that the marking dots are not crossed, which is indicated by the half of the punch dots left on the pieces.
2. Apply pressure in forward direction during hack sawing.
3. Don't rub steel rule on the job.
4. Fix blade in hack saw frame with correct tension.
5. During hack sawing the coolant like water or lubricating oil is to be used.
7. Files are to be cleaned properly after using.

RESULT: - The required Dovetail fit is thus obtained as per given dimensions.

SEMI-CIRCULAR FIT

EXPERIMENT NO: **DATE:**

AIM: - To make a Semi-Circular fit from the given two M.S pieces.

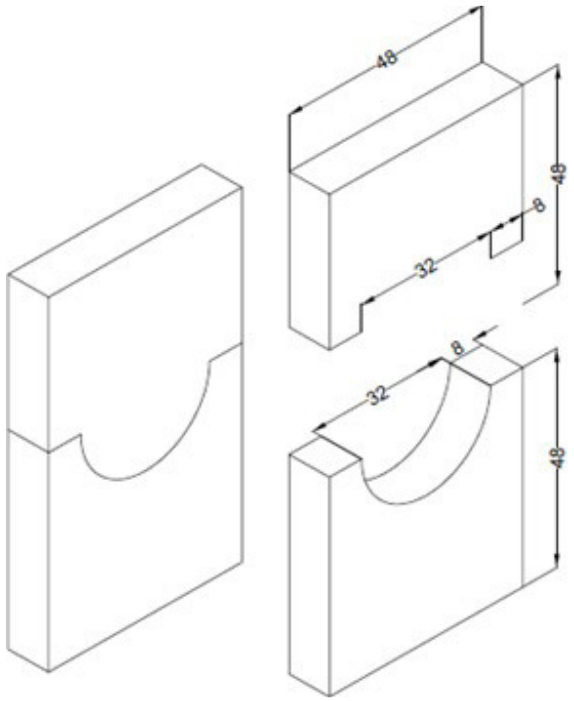
TOOLS REQUIRED: -

1. Bench vice
2. Steel rule
3. Try square
4. Ball peen hammer
5. Scriber
6. Hack saw with blade
7. Dot punch and Centre punch
8. Surface plate
9. Rough and smooth flat files
10. Flat chisel and triangular file

MATERIAL REQUIRED: - Mild steel (M.S) plate of size 48 x 34–2 Nos.

SEQUECE OF OPERATIONS:-

1. Filing
2. Checking flatness and squareness
3. Marking and measuring
4. Punching
5. Sawing
6. Chipping
7. Finishing



ALL DIMENSIONS ARE IN MM

PROCEDURE: -

1. The burrs in the pieces are removed and the dimensions are checkedwith the steel rule.
2. The pieces are clamped one after the other and the outer mating edgesare filed by using rough and smooth files.
3. The flatness, straightness and squareness i.e. right angle betweenadjacent sides are checked with help of Try-square.
4. Chalk is then applied on the surfaces of the two pieces.
5. The given dimensions of the V-fitting are marked carefully.
6. Using the dot punch, dots are punched along the above scribed lines.
7. Using the hack saw, the unwanted portions are removed.
8. Using the flat chisel, the unwanted material in the piece Y is removed.
9. The cut edges are filed by the half round file.
10. The corners of the stepped surfaces are filed by using a square ortriangular file to get the sharp corners.
11. The pieces (X and Y) are fitted together and the mating is checked forthe correctness of the fit.

SAFETY PRECAUTIONS: -

1. Care is taken to see that the marking dots are not crossed, which is indicated by the half of the punch dots left on the pieces.
2. Apply pressure in forward direction during hack sawing.
3. Don't rub steel rule on the job.
4. Fix blade in hack saw frame with correct tension.
5. During hack sawing the coolant like water or lubricating oil is to be used.
7. Files are to be cleaned properly after using.

RESULT: - The required Semi-Circular fit is thus obtained as per given dimensions.

BICYCLE TIRE PUNCTURE AND CHANGE OF TWO WHEELER TYRE

EXPERIMENT NO: **DATE:**

AIM: - To repair bicycle tire puncture and change of two wheeler tyre.

TOOLS REQUIRED: -

1. Rim protector
2. Tire Irons
3. Valve core tool
4. Air compressor
5. Bead breaker
6. Silicone lubricant
7. Tire pressure gauge
8. Hand gloves

MATERIALS REQUIRED: -

1. Bicycle tire puncture kit

BICYCLE TIRE PUNTCURE:

Procedure:

Finding the Puncture:

1. Remove the wheel from the bike.
2. Use tire levers to remove the tire.
3. Locate the hole that's causing the leak.
4. Mark the hole in the tube.

Patching the hole:

1. Remove any foreign objects from the hole.
2. Sand around the hole if necessary.
3. Apply the patch.
4. Know when replacing the tube is a smarter choice.

Putting the Wheel back together :

1. Replace the tube in the tire.
2. Work the tire and tube back onto the wheel.

3. Inspect the bead and pump up the tube gradually to let the tube and tire settle.
4. Replace the wheel on the bike.
5. Consider buying a new tube when you can

CHANGE OF TWO WHEELER TYRE:

Procedure:

Taking off the Wheel:

1. Put your bicycle on its side with the chain facing up.
2. Adjust your gears to the smallest ring if you are removing the back tire.
3. Open and remove the quick release lever, if your bike has one.
4. Use a wrench to loosen the nuts if you don't have a quick release lever.
5. Detach the brake cables if necessary.
6. Lift the wheel off the frame.

Removing the tire and tube:

1. Shift down and hang the bike from a tree or workstand to work on it.
2. Disengage the brakes if they get in the way of removing the wheel.
3. Loosen the nuts that attach the wheel axle to the bike.
4. Pull the chain clear of the gear discs if you are removing the rear wheel.
5. Pull the wheel clear of the bike frame.

Pulling out the old tube:

1. Deflate the tire fully while it's still on the removed wheel.
2. Pry out a section of the outer tire with two simple levers.
3. Pop out the rest of the tire from the wheel rim.
4. Pull the tube out from between the outer tire and wheel rim.

Installing the new tube:

1. Pump up the replacement tube just until it has a basic circular shape.
2. Feed the new tube between the outer tire and wheel rim.
3. Work the tire back onto the inner rim of the wheel frame.
4. Fill the new tube with air to the recommended tire pressure.

Reattaching the wheel:

1. Follow the same procedure you used to remove the wheel, only in reverse.
2. Guide the wheel onto the fork on the bike frame.
3. RE-engage the brakes.
4. Tighten the nuts to secure the wheel in place.

RESULT:

ELECTRICAL WIRING

INTRODUCTION:-

Power is supplied to domestic installations through a phase and a neutral,forming a single phase. A.C 230V, 2- wire system for industrial establishments. Power is supplied through three phase four wire system to give 440V. Fig. Shows the power tapping for domestic and industrial purposes. The neutral is earthed atthe distribution sub-station of the supply.

When supplied to domestic utilizes power is fed to a kilowatt meter and then to a distribution panel. The panel distributes power along several circuits' breakers. The panel also serves as a main switch.

Electrical wiring is defined as a system of electrical conductors, components andapparatus for conveying electrical power from the source to the point of use. The wiring system must be designed to provide a constant voltage to the load.

ELEMENTS OF HOUSE WIRING:-

Fuses & circuit Breakers:

These are the devices to provide protection to a circuit against excess current.

Open link

fuses are not in safe in operations, even though they are cheaper and reliable. Itconsists of a thin strip of metal (or) wire.

Electric switch:

This is a device that makes and breaks or changes the course of electric circuit. It consists of 2 or more contacts mounted on an insulating structure and arranged such that they may be moved in to and out of contact with each other by a suitable operating mechanism.

Plug:

It is a device carrying 2 or 3 contact, designed for engagement withcorresponding plugs pins and arranged for connection to fixed wiring and arranged for attachment to appliances such as radio, T.V, table, fan etc.,

Socket outlet:

It is a device carrying 2 or 3 contacts, designed for engagement with corresponding plug pins and arranged for connection to fixing wiring.

Lamp holder:-

These are designed to hold lamps & connect them in the circuit. Both bay one cap and screw lamp holders are available up to 200 watts lamps.

Ceiling rose:-

A ceiling rose consists of a circular base & cover made of Bakelite. The base has2 or 3 terminal plates. One end of the plate is connected to supply wire connected to pendent lamp, ceiling fan, exhaust fan, etc.

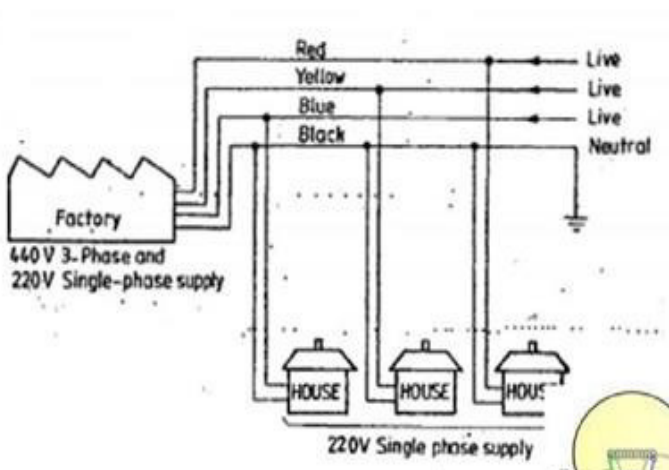
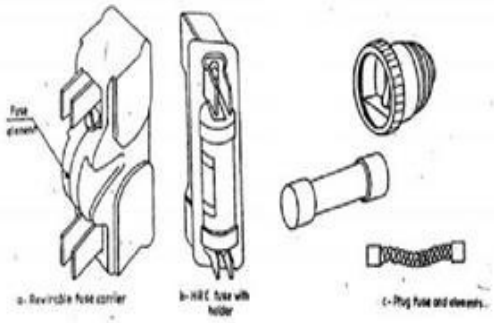


Fig. 3.1 3 phase-4 wire supply



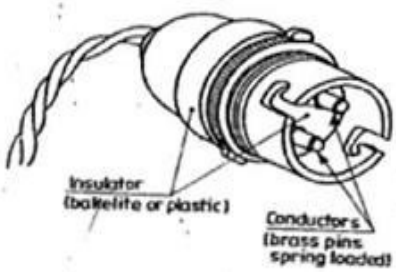
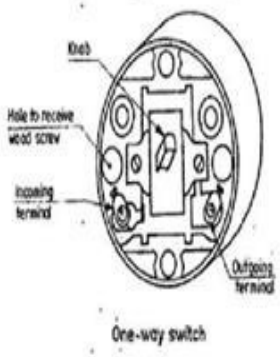
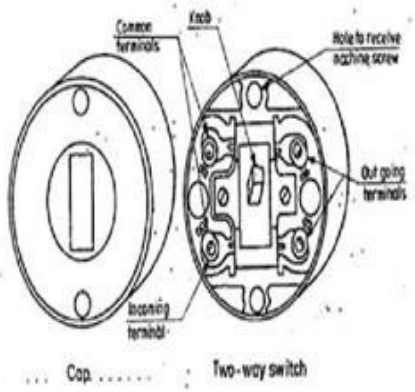


Fig. 3.6 Pendant lamp holder



One-way switch



Cap ..... Two-way switch

Fig. 3.4 Electric switches

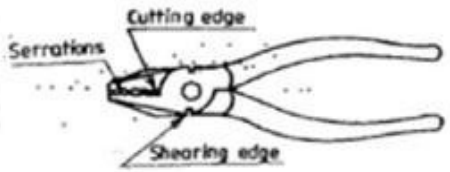


Fig. 8.22 Combination plier

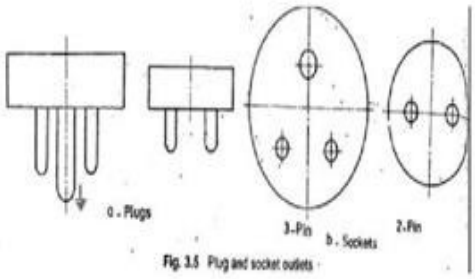


Fig. 3.5 Plug and socket outlets

NOTE: Parts of bulb
1) Glass bulb 2) Low-pressure inert gas 3) Tungsten-filament 4) Contact wire (out of stem) 5) Contact wire (into stem) 6) Support wires7) Stem Glass mount 8) Contact wire (out of stem) 9) Cap (Steeve) 10) Insulation 11) Electrical contact.

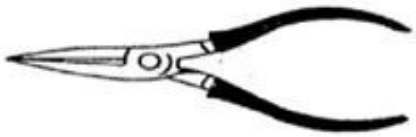


Fig. 8.23 Nose plier

Main switch:-

This is a switch intended to connect or cut-off the supply of electrical to the whole of an installation. It is generally of metal clad type. The metal clad givesgreater strength and safety. The main switch contains one or more fuses, single phase, and A.C. circuits.

Incandescent light:-

Incandescent means 'glowing at white heat'. A lamp actually works like heating elements that it

gives off light by becoming white hot, the amount of power it consume is stamped on the bulb. Higher the wattage, brighter the light. The bulbs have filaments made of tungsten.

Interior wiring:-

Wires & wire sizes:- A wire is defined as a bare or insulated conductor consisting of one (or) several strands. An insulating wire consists of a conductor with insulating material made of Vulcanized Indian Rubber (VIR) (or) Poly Vinyl Chloride (PVC). The wire may consist of 1 or several twisted strands. A multi soreconductor consists of several cores insulated from one another and enclosed in a common seating. Wire sizes are specified by the diameter of the wire, using a standard wire gauge (SWG), which also gives an idea of the current carrying capacity. The specification consists of the both the number of strands and the diameter of the each wire in it

PARALLEL AND SERIES
(WIRING FOR TWO LAMPS CONTROL BY ONE SWITCH)

EXPERIMENT NO: **DATE:**

Two Lamps Connected in Series or Parallel by a One Way Switch: Two lamps may be connected by a one way switch in parallel for bright glow or in series for dull **g**low. This is recommended when the intensity in the room as to be controlled.

SERIES

AIM: - To give connection to two lamps, controlled With Independent SwitchControls with or Without Looping.

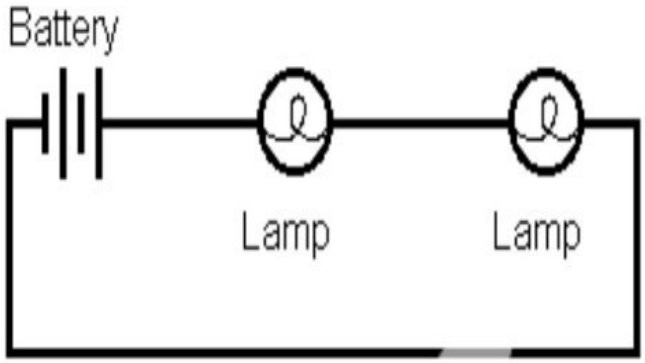
TOOLS REQUIRED: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester

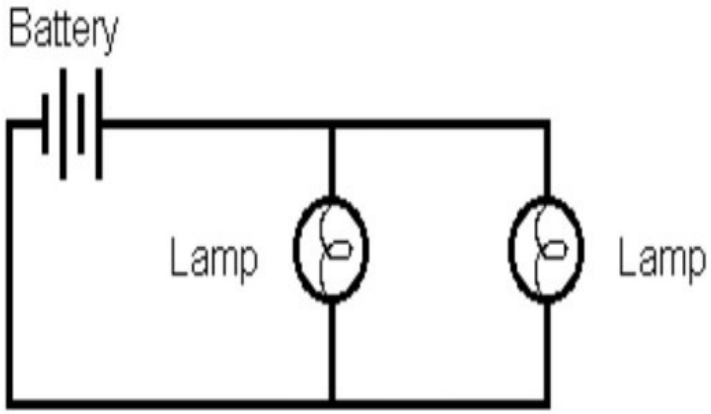
MATERIAL REQUIRED: -

1. Wooden wiring board
2. Silk wire
3. Electrical bulbs - 2 No
4. One-way switch - 1No
5. Wooden round blocks - 1 No
6. Batten lamp holders - 1 No
7. Wire clips
8. Nails
9. Screws

SERIES



PARALLEL



PROCEDURE: -

1. The outline of the wiring diagram is marked on the wooden wiringboard.
2. Clips are nailed to the board, following the wiring diagram.
3. Wires are stretched and clamped with the clips.
4. Round blocks are screwed on to the board, as per the diagram.
5. Wires are connected to the holders and the switch, which are thenscrewed on to the round blocks.
6. Bulb is fitted to the holder.
7. The wiring connections are tested, by giving power supply.

SAFETY PRECAUTIONS: -

1. Electricity has no respect for ignorance. Do not apply voltage or turn-on any device until it has been properly checked.
2. Care should be taken from electrical shocks.
3. Don't touch the connection points.
4. Avoid loose connection.
5. Don't work at damped areas and with wet clothing.
6. Handle the lamp carefully.

Result: - The electrical circuit, for two lights controlled by one switch in paralleland series is thus made.

TWO -WAY SWITCH

EXPERIMENT NO: **DATE:**

AIM: - To give connections to one light controlled by 2 two-way switches.**TOOLS**

REQUIRED: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester
6. 2 two-way switches

MATERIAL REQUIRED: -

1.	Wooden wiring board		
2.	Silk wire		
3.	Electrical bulb	-	1 No
4.	Two -way switches	-	2Nos
5.	Wooden round block	-	3 Nos
6.	Batten lamp holder	-	1 No
7.	Wire clips		
8.	Nails		
9.	Screws		

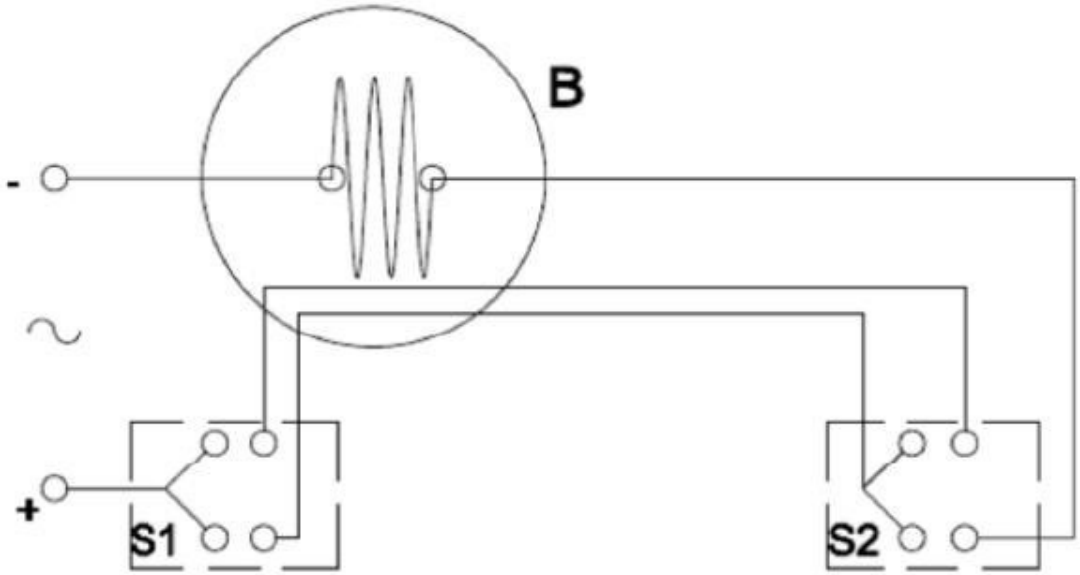


Fig:1 One lamp controlled by 2 two – way switches

PROCEDURE: -

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 the clips.
4. Round blocks are screwed on to the board, as per the diagram.
5. Wires are connected to the holders and the switch, which are thenscrewed on to the round blocks.
6. Bulb is fitted to the holder.
7. The wiring connections are tested, by giving power supply.

SAFETY PRECAUTIONS: -

1. Electricity has no respect for ignorance. Do not apply voltage or turn-on anydevice until it has been properly checked.
2. Care should be taken from electrical shocks.
3. Don't touch the connection points.
4. Avoid loose connection.
5. Don't work at damped areas and with wet clothing.
6. Handle the lamp carefully.

RESULT: -

TUBELIGHT

EXPERIMENT NO: **DATE:**

Tube light: Tube lights are the commonly used light sources for illumination in the houses, industries, commercial organizations etc. A tube light is a low pressure mercury dischargelamp with internal surface coated with suitable fluorescent material.

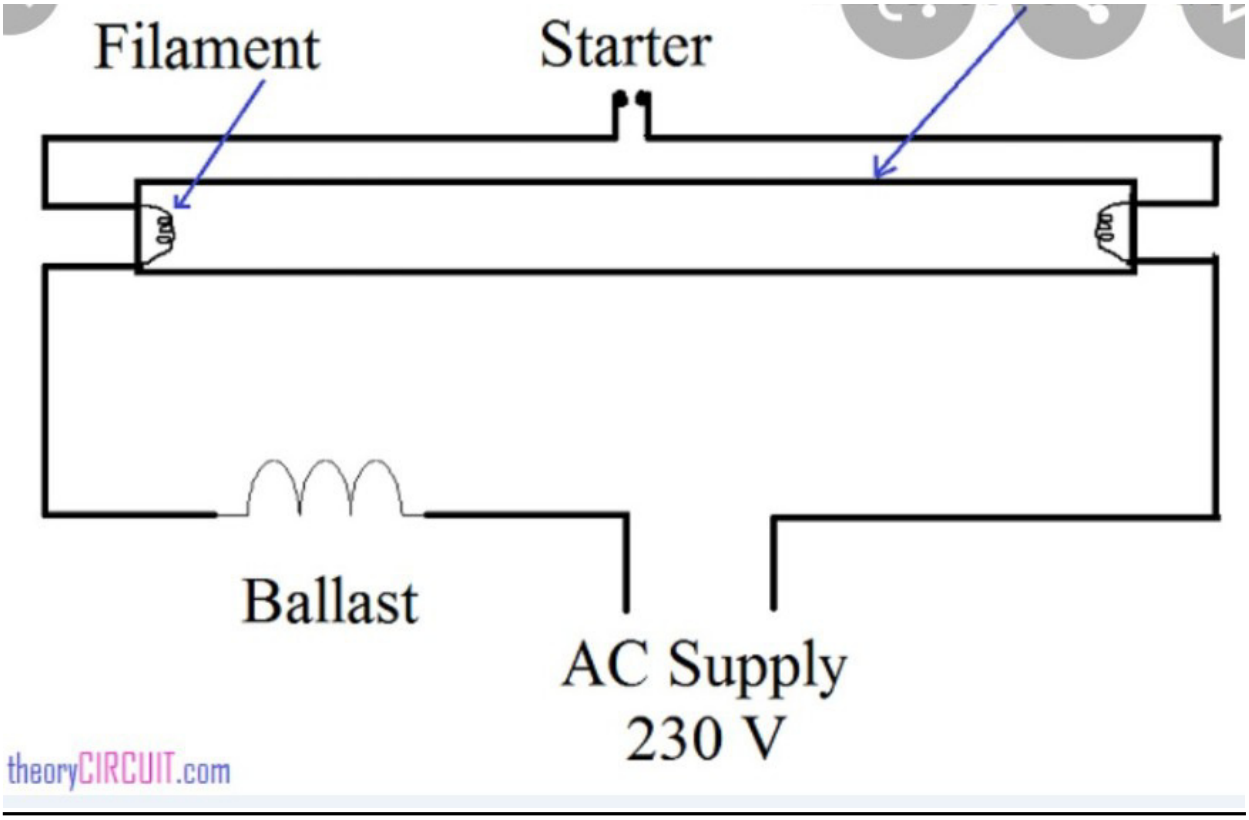
AIM: - To give connections to tube light.

TOOLS REQUIRED: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester
6. 2 two-way switches

MATERIAL REQUIRED: -

1. Wooden wiring board
2. Silk wire
3. Electrical bulb - 1 No
4. Two -way switches - 2Nos
5. Wooden round block - 3 Nos
6. Batten lamp holder - 1 No
7. Wire clips
8. Nails
9. Screws
10. Starter
11. Ballast


Filament
Starter
Ballast
AC Supply
230 V
theoryCIRCUIT.com

PROCEDURE: -

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 the clips.
4. Round blocks are screwed on to the board, as per the diagram.
5. Wires are connected to the holders and the switch, which are thenscrewed on to the round blocks.
6. Bulb is fitted to the holder.
7. The wiring connections are tested, by giving power supply.

SAFETY PRECAUTIONS: -

1. Electricity has no respect for ignorance. Do not apply voltage or turn-on anydevice until it has been properly checked.
2. Care should be taken from electrical shocks.
3. Don't touch the connection points.
4. Avoid loose connection.
5. Don't work at damped areas and with wet clothing.
6. Handle the lamp carefully.

RESULT: -

GODOWN LIGHTING

EXPERIMENT NO: **DATE:**

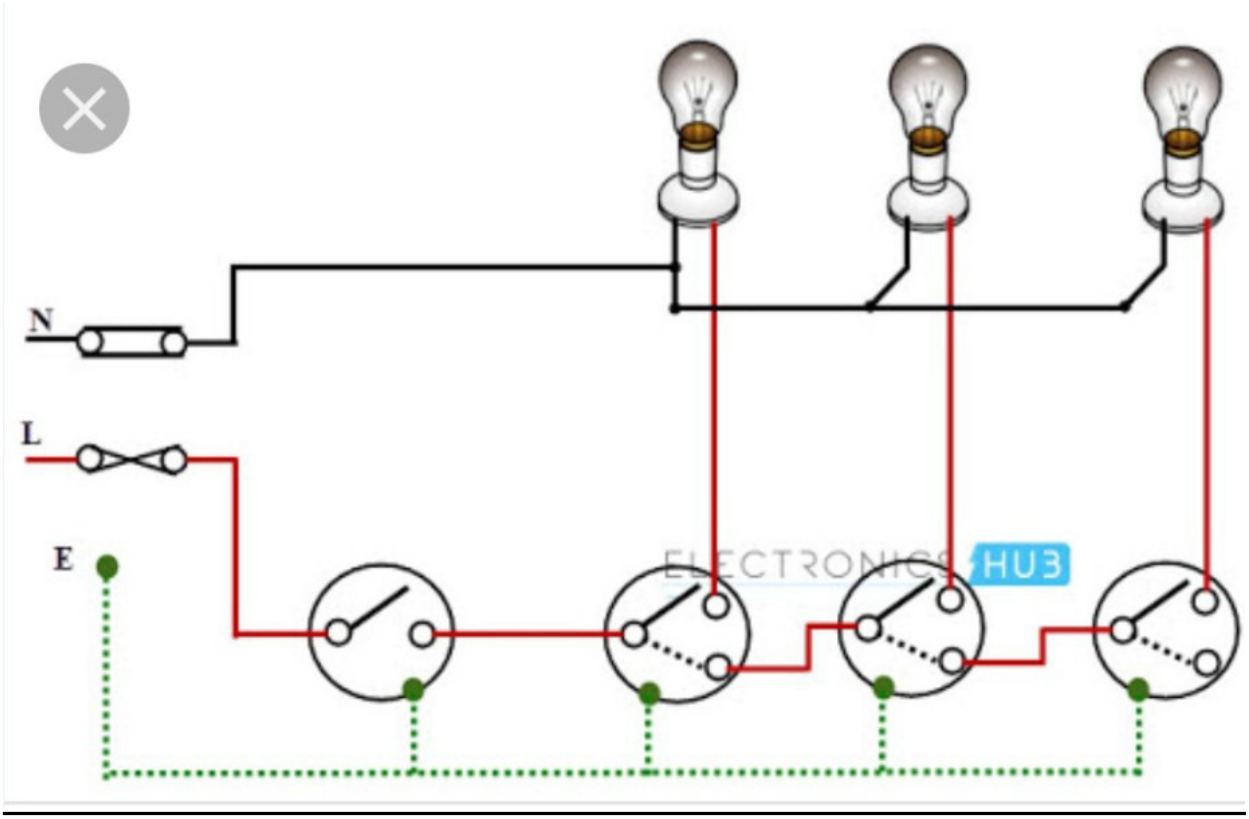
AIM: - To give connections to godown lighting.

TOOLS REQUIRED: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester
6. 2 two-way switches

MATERIAL REQUIRED: -

1. Wooden wiring board
2. Silk wire
3. Electrical bulb - 3 Nos
4. One-way switches - 4 Nos
5. Wooden round block - 7 Nos
6. Batten lamp holder - 3 Nos
7. Wire clips
8. Nails
9. Screws


N
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ELECTRONICS HUB

PROCEDURE: -

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 the clips.
4. Round blocks are screwed on to the board, as per the diagram.
5. Wires are connected to the holders and the switch, which are thenscrewed on to the round blocks.
6. Bulb is fitted to the holder.
7. The wiring connections are tested, by giving power supply.

SAFETY PRECAUTIONS: -

1. Electricity has no respect for ignorance. Do not apply voltage or turn-on anydevice until it has been properly checked.
2. Care should be taken from electrical shocks.
3. Don't touch the connection points.
4. Avoid loose connection.
5. Don't work at damped areas and with wet clothing.
6. Handle the lamp carefully.

RESULT: -

3-PHASE MOTOR

EXPERIMENT NO: **DATE:**

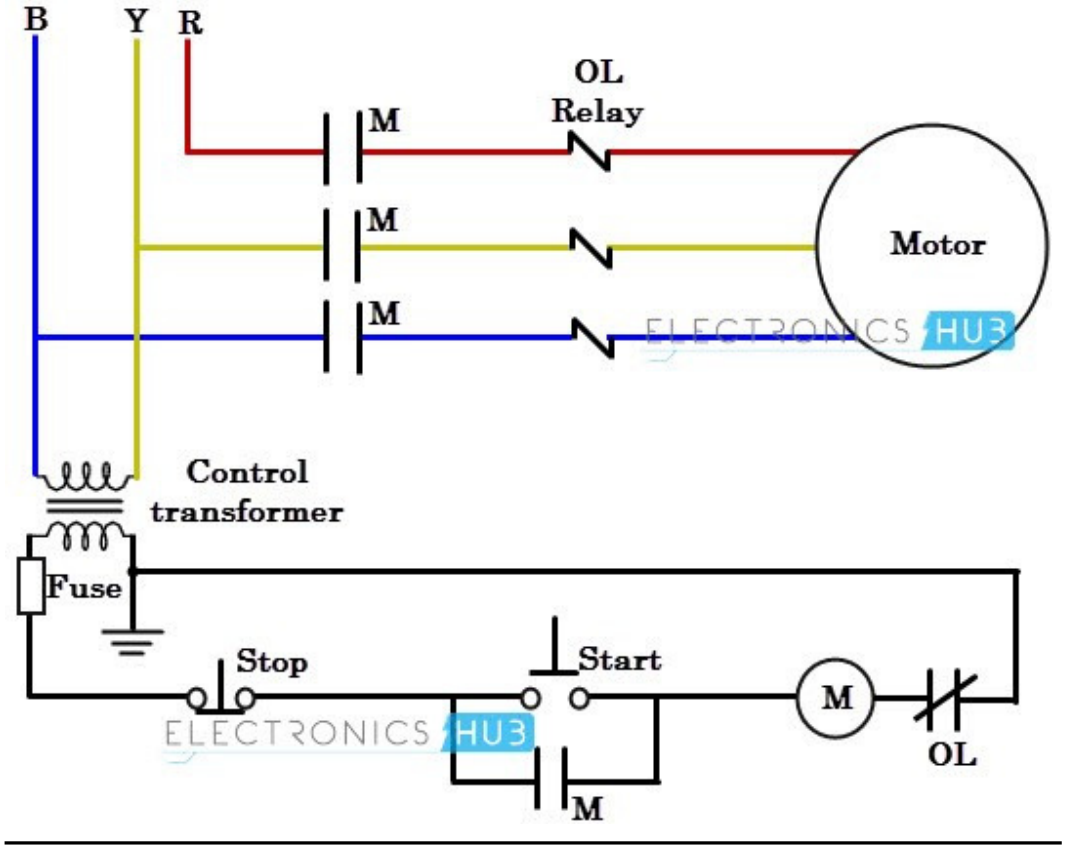
AIM: - To give connections to 3-Phase motor.

TOOLS REQUIRED: -

1. Screw driver
2. Cutting pliers
3. Ball peen hammer
4. Insulation remover
5. Tester
6. 2 two-way switches

MATERIAL REQUIRED: -

1.	Wooden wiring board		
2.	Silk wire		
3.	Electrical bulb	-	3 Nos
4.	One-way switches	-	4 Nos
5.	Wooden round block	-	7 Nos
6.	Batten lamp holder	-	3 Nos
7.	Wire clips		
8.	Nails		
9.	Screws		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Relay
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Motor
Control
transformer
Fuse
Stop
Start
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M

PROCEDURE: -

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 the clips.
4. Round blocks are screwed on to the board, as per the diagram.
5. Wires are connected to the holders and the switch, which are thenscrewed on to the round blocks.
6. Bulb is fitted to the holder.
7. The wiring connections are tested, by giving power supply.

SAFETY PRECAUTIONS: -

1. Electricity has no respect for ignorance. Do not apply voltage or turn-on anydevice until it has been properly checked.
2. Care should be taken from electrical shocks.
3. Don't touch the connection points.
4. Avoid loose connection.
5. Don't work at damped areas and with wet clothing.
6. Handle the lamp carefully.

RESULT: -

SOLDERING

EXPERIMENT NO: **DATE:**

Soldering is one method of joining two or more pieces of metals by means of fusible alloy, called solder, applied in the molten state. The melting temperature ofthe solder should be lower than that of the base metals being joined.

Method of soldering:

The following are the stages involved in soldering work.

1. Clean the surfaces to be soldered.
2. Keep the surfaces to be joined, close together.
3. Apply a thin layer of flux with a brush.
4. Heat the soldering copper to proper temperature.
5. Tack the seam by applying solder at several points.
6. Begin at one end and move the copper bit slowly, adding solder as needed.
7. Allow the joint to cool.
8. Clean the joint and then test the joint for strength.

Advantages:

1. It is the most economical method of joining.
2. It produces leak-proof joint quickly.
3. The temperature involved is very low, when compared to welding. The costof the equipment is cheap.
4. Soldering can be performed on similar or dis-similar metals.