DRONACHARYA
GROUP OF INSTITUTIONS

LABORATORY MANUAL

WORKSHOP PRACTICE LABORATORY

SUBJECT CODE: BWS151/ BWS251

B.TECH. (ME) SEMESTER –I/II

Academic Session: 2023-24, Odd Semester

Dronacharya Group of Institutions
Plot No. 27, Knowledge Park-3, Greater Noida, Uttar Pradesh 201308
Affiliated to

Dr. A P J Abdul Kalam Technical University
Lucknow, Uttar Pradesh 226031

List of Experiments mapped with COs

S. No	Aim of the Experiment	COs
1.	Study of Carpentry shop, tools & operations	**CO1**
2.	To make Lap Tee joint or any one other joint as per drawing	**CO2**
3.	To study Tin Smithy Shop, tools and operations	**CO1**
4.	To make a Plain Pipe as per dimensions given from a piece of GI Sheet	**CO2**
5.	To Study Arc Welding Process, tools and equipment.	**CO4**
6.	To make a single, V-Butt joint by Arc welding	**CO4**
7.	To prepare simple engineering component / shapes by forging as per drawing.	**CO1**
8.	To prepare mould and core assembly and to put metal in mould and fettle the casting.	**CO2**
9.	To prepare a job on lathe involving facing, outside turning, taper turning, step turning,radius making and parting off as per drawing handed over.	**CO3**

Job No: 1

Aim: Study of carpentry shop, tools & operations

Introduction:

Carpentry may be defined as the process of making wooden components. It dealswith the building work, furniture, cabinet making etc. Jointly, i.e., Preparation of joints is one ofthe important operations in all wood works. It deals with making joints for a variety of applications vise, door frames, window frames, wardrobes, cupboards, stairs etc. In this chapter tools and works associated with joinery are presented.

Carpentry Material – Timber:

Timber is the basic material used for any class of carpentry work. The term timber is applied to the woodobtained from; well-grown trees. The trees are cut, sawn into various sizes to suit the required purpose.

Common Varieties of Indian Timber:

Indian timbers most commonly used for various carpentry words are as follows: Babul, Deodar, Mahogany, Mango, Sal, Sissy and teak.

Carpentry Tools:

In carpentry large numbers of hand tools are used for processing the wood. Here, the details of tools that are being used in our workshop only are presented.

Marking and Measuring Tools:

Steel Rule: It is strip of steel with graduations on its edges and is used for measuring and setting out dimensions.

Try Square: Try squares are used for marking and testing of right angles and for testingflatness of surface.

Marking Gauge: It is a tool which has one projected marking pin and is used to mark accurate lines parallel tothe true edge of a wooden piece.

Holding Tools:

Carpenter's Vice: It is used for holding the work for planning, sawing and chiseling. The whole vice is made ofiron and steel. It has two jaws one of which is fixed to the side of the table while the other is movable.

C-Clamp: It is used for holding the work projecting above the top surface of the Bench. This is used to prevent thewood from moving forward when being planned.

Bench Stop: It is simply a block of wood projecting above the top surface of the bench. This is used to prevent the wood from moving forward when being planned.

Cutting Tools:

Wooden Jack Plane: It consists of wooden body in which blade is set at an angle of 45 degrees to the body or sole. The cutting blade used is made of high carbon steel and is very similar to a chisel. Jack Plane is a general purpose plane and is used to produce flat and smooth surfaces on wood.

Hand or Cross-cut Saw: It is used to cut across the grains of the stock or thick wood. The teeth are setalternately to the right and left of the blade, and its purpose is to make the cut wider than the thickness of the blade. This allows the blade to move freely in the cut, without sticking. Her teeth are set at 2.5 mm apart.

Ten on Saw or Back Saw: This saw is mostly used for cross cutting when a finer and more accurate finish is required. The teeth are shaped in the form of an equilateral triangle and generally have 13 teeth for 25 mmlength.

Firmer Chisel or Straight Edge Chisel: It is a general-purpose chisel and is used for Cutting and shaping wood accurately. The width of the blade varies from 1.5 to 50 mm.

Adze: Adze is a side axe used to chop extra wood quickly by carpenters. Adze with very long handle is used toplane long palm tree barks in standing position and also used as a hammer.

Miscellaneous Tools:

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

Claw Hammer: It is a dual-purpose hammer. It has a hammer face, which is used to drive in nails and claw at theother end for pulling out mails from the wood.

Wood Rasp File: It is a finishing tool used to make the wood surface smooth, remove the sharp edges and other interior surfaces. Sharp cutting teeth are provided on its surface. This file is exclusively used in woodwork.

Steel Rule

C- Clamp

Try Square

Marking Gauge

Wooden Jack Plane

Carpenter's Vice

Tenon Saw

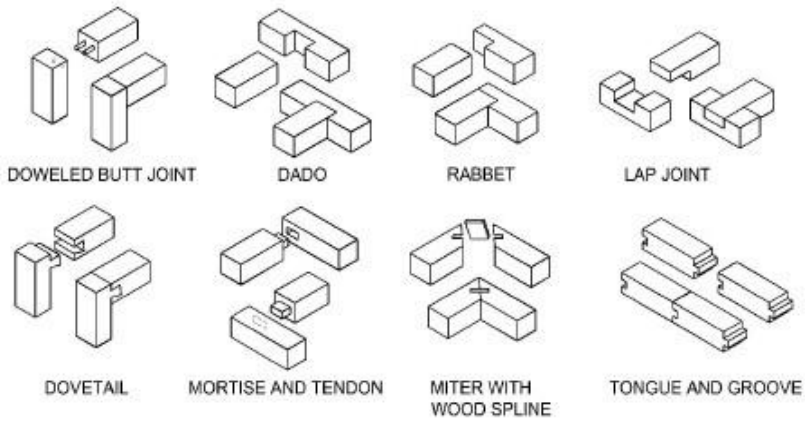
Wood Joints:

There are many kinds of joints used to connect wood stock. Each joint has a definite use and required marking, cutting and joining together. The strength of the joint depends on the amount of contact area. If a particular joint does not have much contact area, then it must be reinforced with nails, screws or dowels.

Lap Joint: Also called halving joint. The aim of this joint is to secure the corners and Intersections of the framing and at the same time in the same plane. They may be usefully employed in many types of framing where strength and appearance are of secondary consideration.

Mortise and Ten on Joint: This family of joints is a large one and does probably the woodworker use the commonest. It consists of a rectangular peg (ten on) fitting into a rectangular hole (mortise).

Bridle Joint: These are the reverse of mortise and ten on joints in form and are often called the open mortise ten on. These joints are used where the members are of square or near square or near-square section and thus unsuitable for making a mortise and ten on joint of good proportions.



Instructions

1. When you are using your thumb as a guide for cross cutting and ripping, raise it sufficiently high.
2. Planning should be done along grains only.
3. Push the chisel away from you while chiseling.
4. Always use marking gauge (or) a mortise gauge for drawing lines.
5. Check the squareness of planned surfaces with try square.
6. Use wooden mallets for driving chisel.
7. Do not test sharpness of the edge of the cutting tools on your hand.
8. Do not keep your hands In front of the sharp edged tools while they are in use.
9. Only unwanted material should be removed.

Safety Precautions:

General: Make sure that your hands are not in front of sharp edged tools while you are using them.

Saws: Be careful when you are using your thumb as a guide in cross cutting.

Chisels:

1. Never chisel towards any part of the body.
2. Test the sharpness of the cutting edge on wood or paper, not on your hand.

Job No: 2

Aim: To make Lap Tee joint or any one other joint as per drawing

Material Required: Teak wood 300mm X 45mm X 35mm

Tools Required:

1. Steel rule 300mm
2. Handsaw 300mm
3. Wooden jack plane 450mm
4. Try square 200mm
5. Marking gauge 200mm
6. C-Clamp 200mm
7. Firmer chisel 150mm
8. Adze 150mm

Sequence of Operations:

1. Marking 2. Planning 3. Cutting 4. Setting

Procedure:

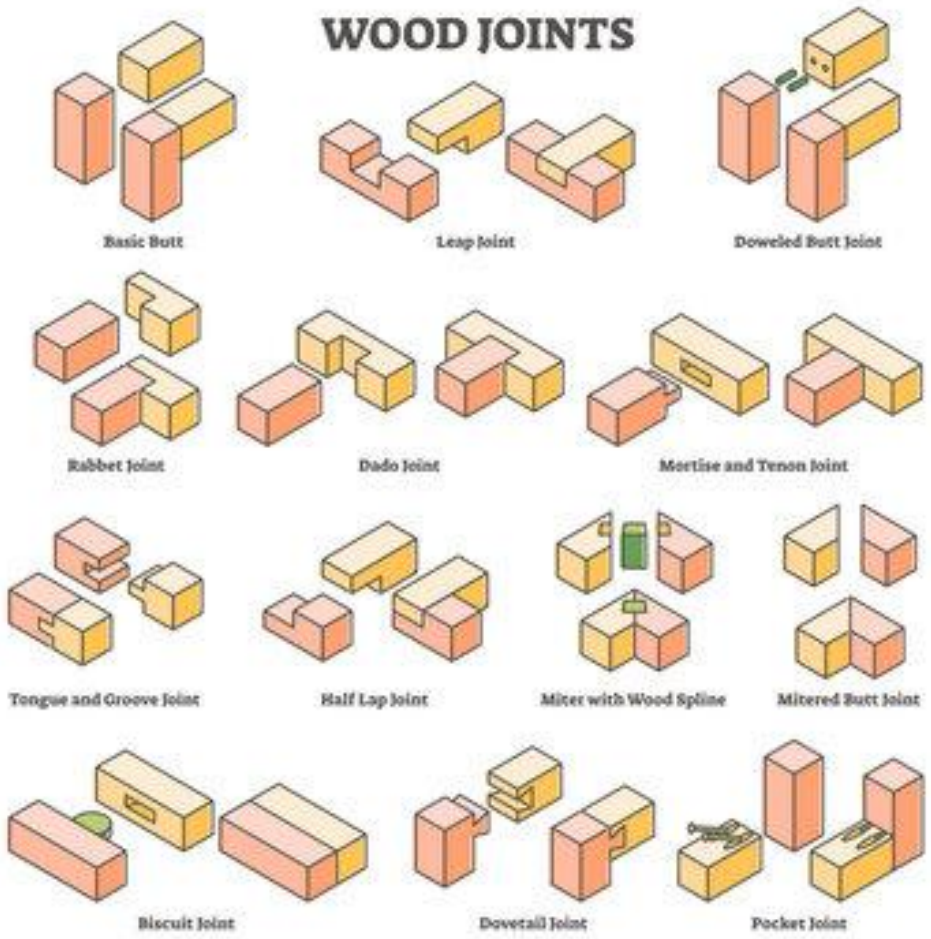
1. Select a teak wood material and mark the size as per drawing with the help of marking tools like steel rule,marking gauge, try square.
2. Planning of sides with the help of wooden jackplane to maintain the required Dimensions.
3. Fix the work piece in carpentry vice and cut into two equal pieces of size 150mmX 30mm with the help ofhandsaw.
4. Mark the two work pieces for male cutting and groove cutting as per dimensions.
5. Fix the work pieces one by one on the bench with the help of 'C' Clamp and a groove is made as shown indrawing with the help of chisels and adze.

The two work pieces are fitted to make Lap Tee Joint as per drawing.

Precautions:

1. We should be careful while marking and planning
2. Special care is required while cutting the groove with firmer chisel so that thedimension is not exceeded.

Result: Lap Tee Joint is prepared as per given dimensions


WOOD JOINTS
Basic Butt
Leap Joint
Doweled Butt Joint
Rabbet Joint
Dado Joint
Mortise and Tenon Joint
Tongue and Groove Joint
Half Lap Joint
Miter with Wood Spline
Mitered Butt Joint
Biscuit Joint
Dovetail Joint
Pocket Joint

Job No: 3

Aim: To study Tin Smithy Shop, tools and operations

Introduction:

Many engineering and house articles such as boxes, cans, funnels, ducts etc. are made from a flat sheet of metal. The 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. Allowance should be given in the drawing stage for folding and bending. This allowance Depends upon the radius of the bend and thickness of the sheet metal.

Sheet Metal Materials:

A variety of metals are used in a sheet metal shop such as galvanized Iron, black, Iron, tin, Stainless Steel, copperand Aluminum.

Hand Tools:

The common hand tools used in sheet metal work are steel, try square, Wire gauge, Scriber, Ball peen hammer, Nylon Mallet, Snips Divider, Stakes, Cutting plier and Soldering Iron. Here, the details of tools that are being equipped by our workshop purpose only are presented.

Wire Gauge: The thickness of sheet is referred in numbers known as standard wire gauge (SWG). The gaps inthe circumference of the gauge are used to check the gauge number.

Steel Rule: It is a strip of steel with graduations on its edges. It is used for measuring and setting out dimensions.

Scriber: A scriber is a slender steel tool, used to scribe or mark lines on sheet metal.

Snips: Hand shears or snips are used to cut sheet metal.

Straight Snips: These are having straight blades and are used for cutting along straightLines and for trimming edges.

Curved Snips: These are having curved blades and are used for cutting circles and irregular shapes.

Divider: It consists of two pointed legs. The points are hardened and tempered to prevent wear. It is used fortransferring the sizes and scribing curves or circles.

Bench vice: It is generally used for holding and bending the work piece.

Hammers: Light weight hammers and mallets are used in sheet metal work.

Ball Peen Hammer: It has a cylindrical, slightly curved face and a ball head. It is a general purpose hammer used mostly for riveting in sheet metal work.

Cross Peen Hammer: It has a tapered peen end and is perpendicular to the handle. Because of this,

it can reachawkward corners.

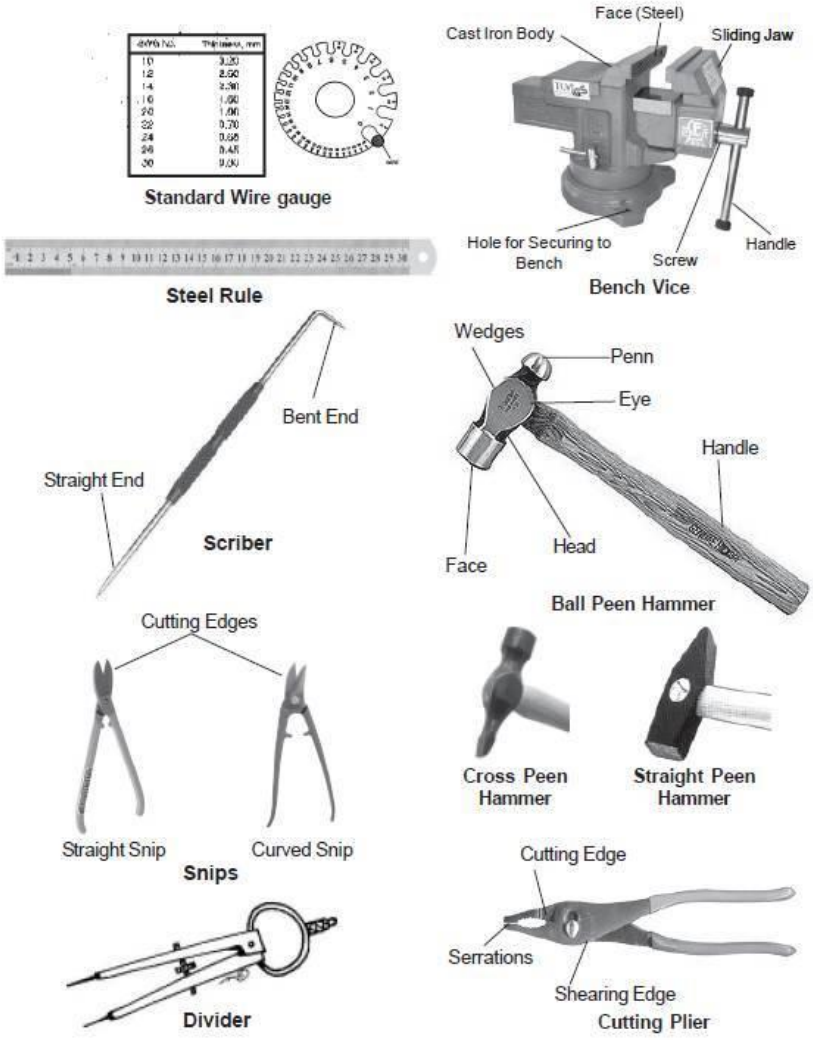
Straight Peen Hammer: It has the peen end similar to the cross peen, but it is positioned parallel to the handlewhich can be used conveniently for certain operations of folding.

Cutting Plier: Used for holding, cutting and bending works.

Nylon Mallet: It is used for bending and folding work. It is light in weight, covers more area and do not damagethe surface area.

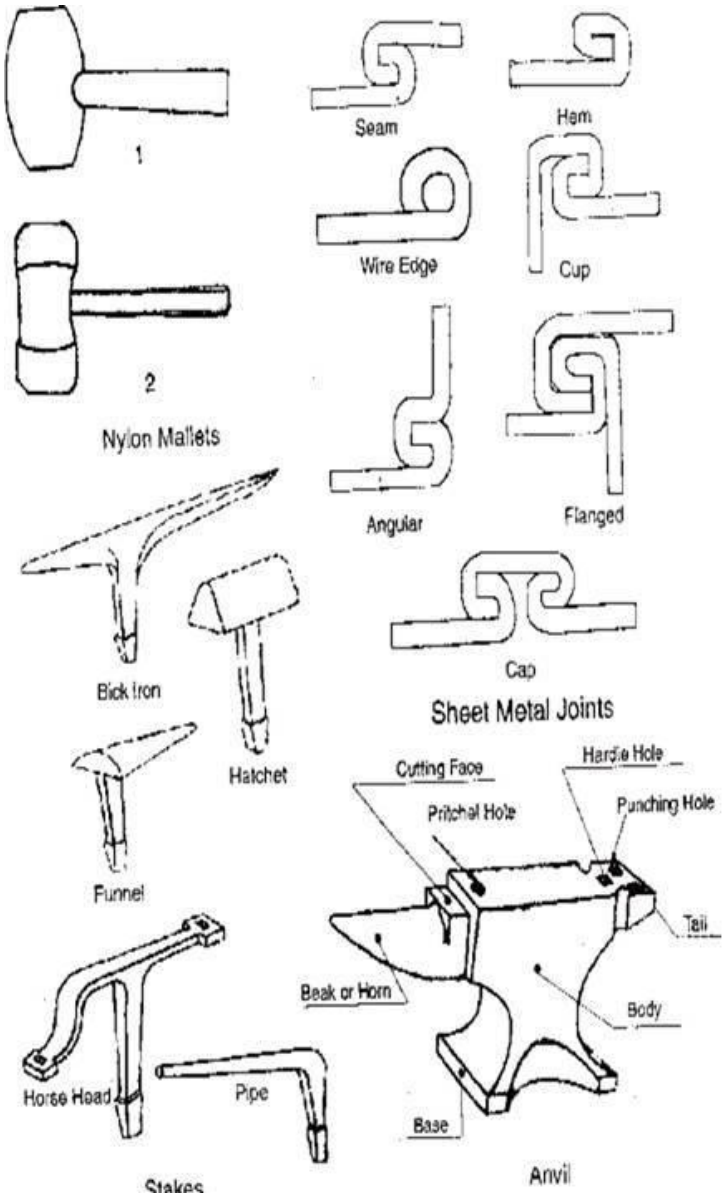
Stakes: Stakes are made of steel and forged in a variety of shapes and sizes. These are used as supporting tooland to form, seam, bend or rivet sheet metal objects.

Anvil: Anvil provides the necessary support during hammering. It is also useful for operations such as bending. Its body is generally made of mild steel and a strip of high carbonsteel about 20 mm thick is welded on top to provide hard face.



Sheet Metal Joints:

Various types of joints are used in sheet metal work, to suit the varying requirement. Some commonly used sheet metal joints and folded edges are shown in the figure. These are self-secured joints, formed by joining together two pieces of GI sheet metal and using the metal itself to form the joint.



Sheet Metal Layout:

The shapes of most articles made with sheet metal are in few geometrical forms. All these forms are made from flat sheet; therefore the first requirement is developing the lines, which forms the pattern. The development or stretch out of a job is called pattern and developing lines which forms a pattern

is layout. It may be drawn on paper first and then transferred in the sheet or it may layout directly on sheet metal. When a pattern is made repeatedly, it is generally made of metal and referred to as a template.

Instructions:

1. Draw the development of object to be prepared with true dimensions only.
2. Use curved snip for trimming along inside curves.
3. Always provide folding (Hem) for top edges of the object to avoid sharp edges and to stiffen the sheet.
4. Ground properly the exposed metal parts of electrically heated soldering iron.
5. For good soldering the metals to be joined must free from dirt, grease and oxide.
6. Do not pull (or) peel the cut portion by hand while cutting with snip.
7. Do not bend the sheet with hand, always use nylon mallet with proper support.

Safety Precautions:

1. Use hand leather gloves while handling heavy sheets.
2. Avoid feeling the cut portion by hand while cutting with snip.
3. Do not let sheet metal slip through the hands.
4. Never carry tools in pockets.

Exercise:

1. Plain pipe
2. Rectangular tray
3. Triangular tray
4. Funnel

Job No: 4

Aim: To make a Plain Pipe as per dimensions given from a piece of GI Sheet

Materials Required: 122 mm x 100mm size Galvanized Iron sheet.

Tools Required:

1. Steel rule 300 mm
2. Scriber 150 mm
3. Try square 200 mm
4. Straight snip 210 mm
5. Ball peen hammers 750 gm.
6. Nylon mallet 450 gm.
7. Cutting plier 200 mm
8. Cylindrical stake Ø 35 mm

Sequence of Operations:

1. Marking 2. Cutting 3. Folding 4. Bending 5. Finishing

Procedure:

1. Take a galvanized iron sheet.
2. Mark the rectangular length of 122mm and 100mm with scriber as per sketch.
3. Cut the rectangular piece from sheet with straight snip.
4. Mark a bend of 4mm on two parallel sides for joining two edges of the sheet.
5. Using nylon mallet and cutting plier join the two edges of the sheet as per sketch. So that the final circumference length is 110mm.
6. Select the cylindrical stake and roll it to obtain correct shape of plain pipe.

Precautions:

1. Should pay attention while marking.
2. Bending and finishing should be done neatly and straight.
3. Cutting should be done carefully along the marked lines, and while cutting care should be taken to cut it at thefurther end. Otherwise the metal sheet might bend giving wrong shape.

Result: Required plain pipe

Job No: 5

Aim: To Study Arc Welding Process, tools and equipment.

Introduction:

Welding is a process of joining two similar or dissimilar metals by the application of heat with or without application of pressure and addition of filler material. The welding is extensively usedin manufacturing industry, construction industry and maintenance work, replacing riveting and bolting, to a greater extent. The various welding processes are

1. Electric arc welding
2. Gas welding
3. Thermal welding
4. Resistance welding and
5. Friction welding

However only electric arc welding is discussed here. In this process, the work pieces are melted along a commonedge, to their melting point and then a filler metal is introduced to form the joint on Solidification. The materials to be welded must be free from rust, scale oil or other impurities, so as to obtain a sound weld.

Arc Welding:

In arc welding, the heat required for joining the metals is obtained from an electric arc. Transformers or motor generator sets are used as arc welding machines. These machines supply high electric Currents at low voltages and an electrode is used to produce the necessary arc. The coated electrode serves as the filler rod and arc melts the surfaces so that the metals to be joined are actually fused together. In addition to the welding machine, the following accessories and tools are needed for carrying out the welding work. The given figure shows the principle of Arc Welding using a transformer.

Welding Cables: Two welding cables are required, one from the machine to the electrode holder and the other, from the machine to the ground clamp. Cables are specified by their current carrying capacity say 300A, 400A etc.

Electrodes: Filler rods used in arc welding are called electrodes. These are made of metallic wire Called core wire, having approximately the same composition as the metal to be welded. These are coated uniformly with a protective coating called flux. ‘While fluxing an electrode about 20mm of Length is left bare at one end for holding it with the electrode holder. It helps in transmitting full current from electrode holder to the front end of the electrode coating. Flux acts as an insulator of electricity and protects from oxidization.

Electrode Holder: The electrode holder is connected to the end of the welding cable and holds the electrode. It should be light, strong, easy to handle and should not become hot while in operation. The jaws of the holder are insulated, offering protection from electric shock.

Ground Clamp: It is connected to the end of the ground cable and is clamped to the work or Welding table to complete the electric circuit. It should be strong and durable and give a low Resistance connection.

Bench Vice: It is commonly used for holding the work piece. It has to harden Steel jaws having serrations to ensure good grip. When the vice handle is turned to a clockwise direction, the sliding jaw forces the work piece against the fixed jaw and is fixed on the working table.

Hack Saw: The hacksaw is used for sawing all metals except hardened steel. A hand hacksaw consists of frame, handle blade, prongs, tightening screw and nut.

Steel Rule: The steel rule is one of the most useful tools in the workshop for taking linear measurements ofblanks and articles to an accuracy of 1.0 to 0.5mm

Scriber: A scriber is a slender steel tool, used to scribe or mark lines on metal work pieces.

Try Square: Try square is used for making and testing angles of 90 degrees and is used for checking thesquareness of many types of small works, when extreme accuracy is not required.

Flat File: Flat file is used to remove small amount of material from the surface of the metal part. It is also usedto remove sharp edges from the metal pieces.

Wire Brush or File Card: A wire brush is used for cleaning and preparing the work piece before and after thewelding.

Welding Table: It is made of steel plate and pipes. It is used for positioning the parts to be welded properly. **Welding Screen:** When people are around where welding is done, they may be protected from the rays of the arcby means of a protected screen.

Face Shield's face shield is used to protect the eyes and face from the rays of the arc and from spatter or flying particles of hot metal. It is available in hand or helmet type. The hand type is preferred to use and they are made of light weight, non-reflecting fiber fitted with dark glass.

Hand Gloves: Hand gloves are used for protecting the arms while welding form sparks and from current.

Flat Tong: A flat tong is used for holding works of rectangular shape during welding and after welding. **Chipping Hammer:** It is made of tool steel and is used for removing slag formation on welds. One end of thehead is sharpened like a cold chisel and the other end to a blunt, round point.

Ball Peen Hammer: Ball peen hammers are used to stride a job or a tool. It consists of four parts namely peen,head, eye and face. Ball Peen hammer is chiefly used for chipping and riveting.

Welded Joints:

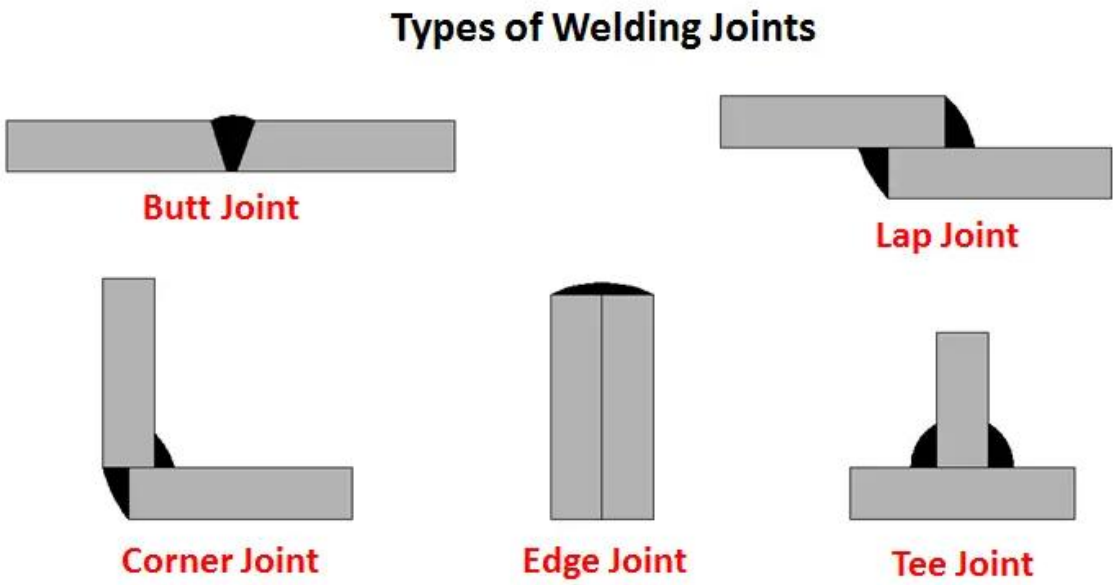
The relative positions of the two pieces being joined determine the type of joint. The following joints arecommonly used in fusion welding.

The Butt Joint: It is used to join the ends or edges of two plates or surfaces located approximately in the sameplane with each other.

The Lap Joint: It is used to join two overlapping plates so that the edge of each plate is welded to the surface ofthe other.

The T-Joint: It is used to weld two plates or sections whose surfaces are at approximately right angles to eachother.

The Corner Joint: It is used to join the edges of two sheets or plates whose surfaces are at the angle ofapproximately 90 den to each other. It is common in the construction of boxes, tanks, frames etc.



Preparation of Work:

Before welding, the work pieces must be thoroughly cleaned of rust, scale or other foreign material. Thin pieces of metal are generally welded without beveling the edges. However, thick work pieces should be beveled to ensure adequate penetration and fusion of all parts of the weld. But, in either case, the parts to be welded must separate slightly to allow better penetration of the weld. Different edge preparation is particularly used in fusion welding process for welding butt joints. These are: square Single-V, Double-V, Single-U and Double-U. The preparation of edges depends upon the thickness of metal being welded.

Instructions:

General:

1. Always weld in a well-ventilated place. Fumes given off from welding are unpleasant and in some cases maybe injurious, particularly from galvanized or zinc coated parts.
2. Do not weld around combustible or inflammable materials, where sparks may cause a fire.
3. Never weld, containers, which have been used for storing gasoline, oil or similarmaterials, without first having them thoroughly cleaned.

Arc welding:

1. Check the welding machine to make sure that it is properly grounded and that all leads are properly insulated.
2. Never look at the arc with a naked eye. The arc can burn your eyes severely. Always use a face shield whilewelding.
3. Prevent welding cables from coming in contact with hot metal, water oil or grease. Avoid dragging the cablesaround sharp corners.

4. Ensure proper insulation of the cables and check for openings.
5. Always wear the safety hand gloves, apron and leather shoes.
6. Always turn-off the machine when leaving the work
7. Apply eye drops after welding is over for the day to relieve the strain on the eyes.
8. While welding, stand on dry footing and keep the body insulated from the electrode, any bare parts of theelectrode holder and the work

Safety Precautions:

1. Use welding screen, leather apron and leather hand gloves while welding
2. Use flat tong and hand gloves for handling of work pieces during and after welding.

Exercise:

1. Single 'V' Butt Joint.
2. Lap Joint.
3. Lap 'T' Joint
4. Vee corner Joint.

Job No: 6

Aim: To make a single, V, but joint by Arc welding

Material Required:

Mild Steel plates: 80mm X 40mm X 6mm = 2 No'sMild Steel electrode ¢ 3.15 mm

Equipment required:

A.C. Transformer with all welding accessories like Electrode holder, cables.

Tool Required:

1. Steel rule 300mm
2. Scriber 150mm
3. Flat file 300mm
4. Try square 200mm
5. Flat Tong 450mm
6. Chipping hammer 200mm
7. Ball peen hammers 750mm
8. Wire brush
9. Welding screen

Sequence of Operations:

1. Marking 2. Filing 3. Welding 4. Finishing

Procedure:

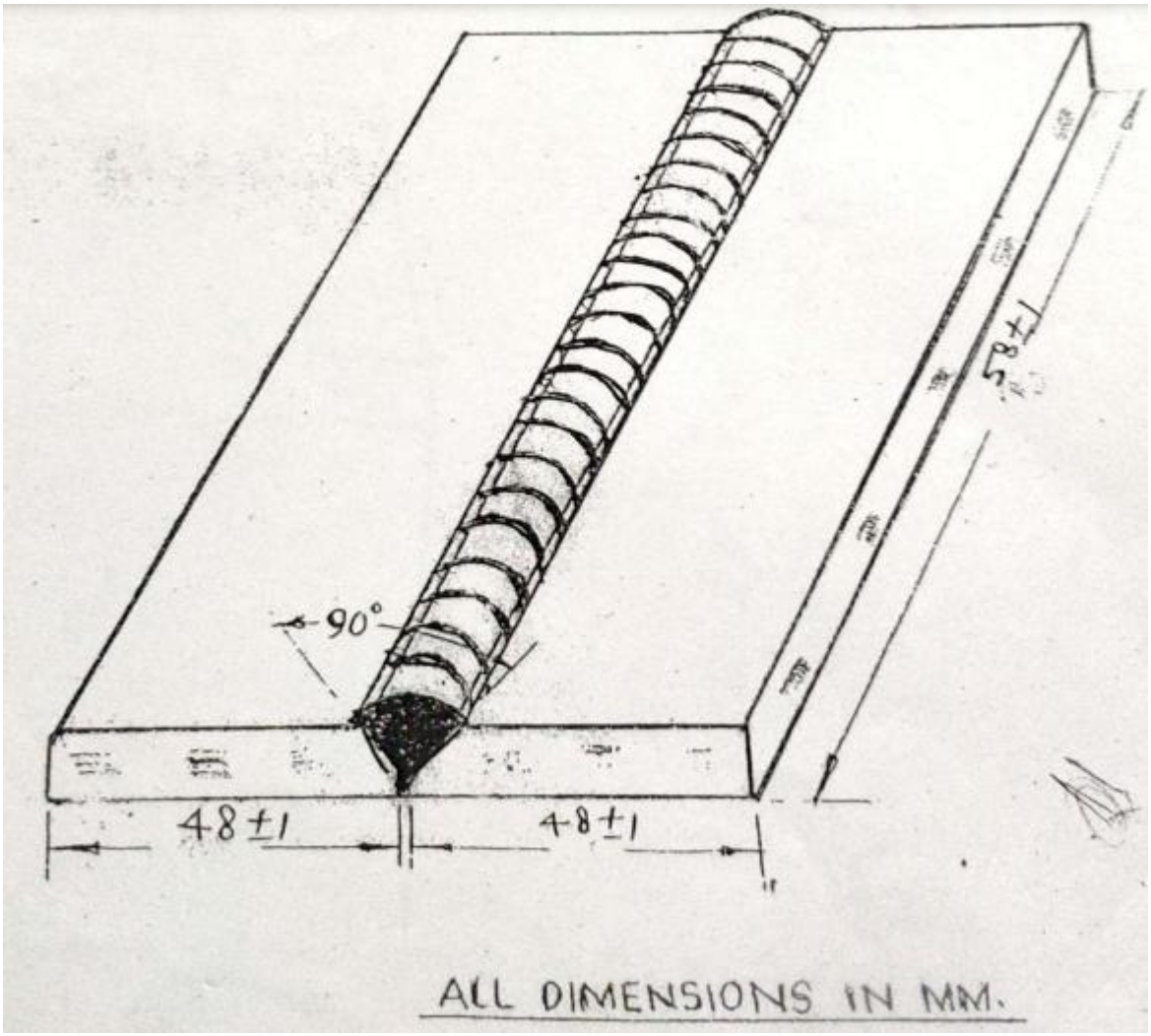
1. Take two Mild steel plates of size 80mm X 40mm X 6mm.
2. Fix the work pieces one by one in bench vice and file the faces of work pieces using flat file as perdimensions.
3. Then mark the pieces using steel rule and scriber as per drawing.
4. Again fix the work pieces one by one in bench vice and file the pieces to get the required shape of the edge asper drawing.
5. Select the appropriate welding fixture and hold the pieces as per drawing.
6. At some selective places of the joint perform some weld spots for perfect alignment ofthe job.
7. Start the welding from one end and proceed to another end.

8. Like this continue the welding operation for one more time to get weld bead.
9. Allow the welded joint for solidification.
10. After cooling, chip off the slag from welded joint with the help of chipping hammer and clean the joint bywire brush.

Safety Precautions:

1. Use welding screen leather apron and leather hand gloves while welding
2. Use flat tong and hand gloves for handling of work pieces during and after welding.

Result: Single 'V' butt joint is prepared as per given dimensions.



Job No: 7

Aim:-To prepare simple engineering component / shapes by forging as per drawing.

Material required:-M.S. rod of diameter 12 mm, for making chisel.

Tools required: - Steele scale, scriber, hand saw, cross cut file, furnace, hammer, anvil, flat tong, and swageblock.

Procedure for Chisel:-

1. M.S. square of required length is to be cut.
2. One end of the piece is heated in furnace to red hot condition.
3. Hot piece is brought to anvil holding by a tong.
4. The piece is shaped using smith hammer.
5. If required the piece is reheated and the process is repeated.
6. The piece is put in to water for tempering.

Procedure for Ring:-

1. M.S rod of required length to be cut.
2. The piece is heated in furnace to red hot conditions.
3. Hot piece is held with a tong and brought to anvil.
4. The piece is shaped on horn anvil using hammer.
5. If required the piece is re heated and the process is repeated.
6. Complete round is made on swage block.
7. The piece is put in to the water for tempering.

Precautions:-

1. Wear `apron, shoes, nose mask, gloves and tight fitted clothes.
2. Be careful and attentive while working on job offorging.
3. Hammering should be done only when the work piece is hot.
4. Always use appropriate tongs and tools.

Job No: 8

Aim:-To prepare mould and core assembly and to put metal in mould and fettle the casting.

Material Required:-

Green sand mould

River sand	-	70%
Clay sand	-	10%
Molasses	-	5%
Water	-	8-10%

Additives

Coal dust	-	2-5%
Saw dust	-	2%
Silica sand	-	2%

Tools required:-

Moulding flask (cope and drag), shovel, hand riddle, vent wire, trowel, lifter, gate cutter, strike off bar, runner andriser, spruce pin, slicks, rammer, swab, crucible, furnace, tong

Procedure:-

1. A mould box suitable for the pattern should be selected.
2. Lower part of the pattern is placed in the middle of drag.
3. Drag is filled with the moulding sand and rammed properly.
4. Parting sand is sprinkled over the top surface of the mould.
5. The cope is placed over the drag in proper position.
6. Then the top part of the drag in proper position.
7. Runner and riser are placed in position and the cope is filled with sand and rammed.
8. Then the cope is separated from drag and the pattern is removed.
9. The gate is made using gate cutter and the mould cavity is repaired for small damage.

10. The core is placed in position and located.
11. The mould is allowed for drying.
12. The mould is ready for pouring.
13. Metal is melted in crucible to correct temperature.
14. The crucible is held with a tong and the metal is poured in the mould and allowed to solidify and cool.
15. After cooling the casting is extracted breaking the mould.
16. Gates and riser are cut off.
17. The entire surface is cleaned using wire brush.

Precautions:-

1. Wear apron, shoes, gloves and tight fitted clothes.
2. Be careful and attentive while working on hot metal.
3. Runner and risershould be placed at the right place.
4. Sand should be mixed properly.

Job No: 9

Aim: To prepare a job on lathe involving facing, outside turning, taper turning, step turning, radius making and parting off as per drawing handed over.

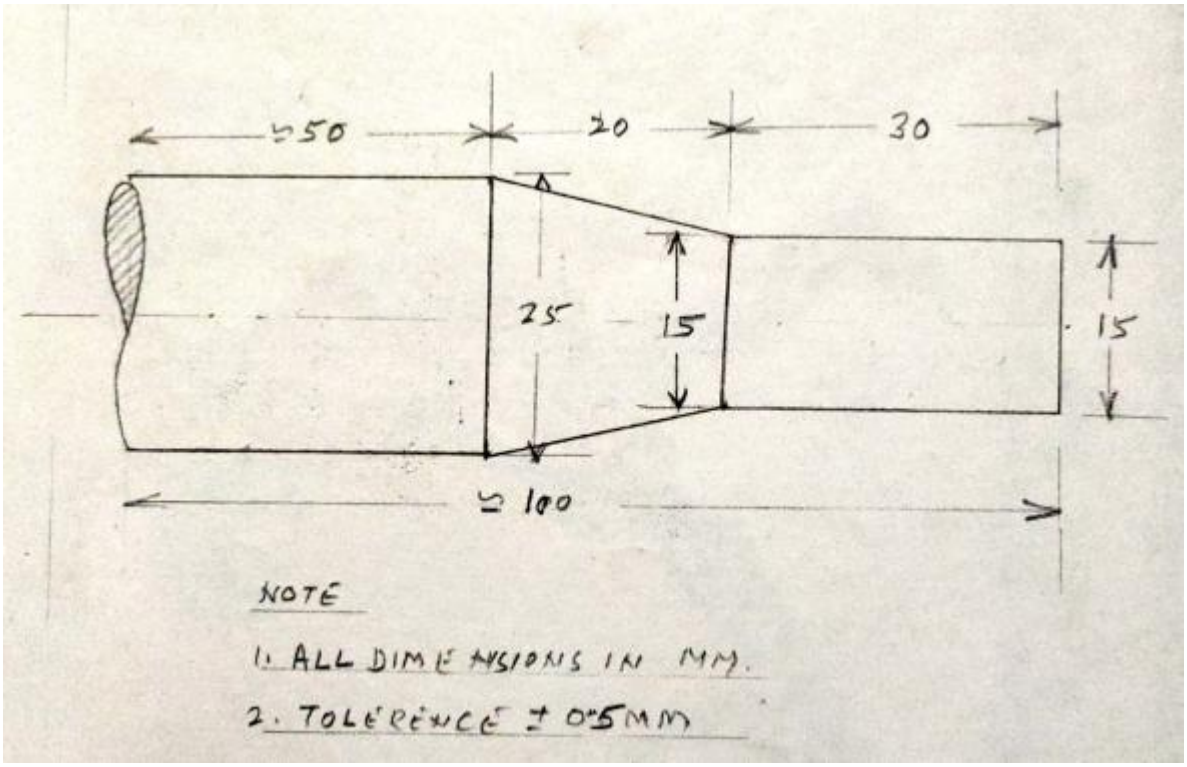
Tool required: Single point cutting tool, radius tool, parting tool.

Material required: Mild steel rod.

Instruments required: Steel rule, venire caliper, outside caliper, sine bar.

Procedure:-

1. Job is fixed in three jaw chuck for proper alignment.
2. Single point cutting tool is fixed in the tool post and facing operation is completed.
3. A rough cut is used to turn the outer periphery.
4. Final turning and step turning operation are completed in sequence.
5. The compound slide is set at the taper angle as per calculation with the center line and tapering operation is completed through different cuts.
6. Radius tool is fixed in tool post form a king radius and the operation is completed.
7. Form a in training the proper length of the job parting off tool is used and parting operation is completed.



Ms. Krati Hardya & Mr. Deepak Kumar
Lab In-Charge

Dr. Shailesh Kr Singh
HOD ME

Prof.(Dr.) Seema Shukla
Director