



SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)
SRM Nagar, Kattankulathur-603 203.



DEPARTMENT OF MECHANICAL ENGINEERING

ME3367 - Manufacturing Technology Laboratory -I
(III SEMESTER – MECHANICAL)

LABORATORY MANUAL

(REGULATION – 2023)

ACADEMIC YEAR 2025-2026

SAFETY PRECAUTION

- Always wear uniform, shoes and gloves for safety
- Never operate any machines until you have been instructed properly
- Always wear goggles to protect your eyes from flying chips.
- Never hold the job when the machine runs.
- Never give heavy cut on longer job
- Never change the gear and belt when the machine is running
- Always use the correct size spanner and tool for fitting and removing of tool
- Never try to clear the chips when the machine is running
- To prevent accident, clean the spilled oil and grease immediately
- Always clear the area around the machine and machine tool surface
- Leather shoes or boots with steel toes are recommended.
- No open toed shoes or sandals are allowed in the shop.
- Do not wear loose clothing. Cotton clothes are best to wear.
- Remove all jewellery and tie back longhair.
- Do not operate any machine equipment unless you have been instructed on its proper use and the safety risks involved with the machining operation.
- Do not leave any machinery or power tools running and unattended.
- Clean up metal shavings, oil, etc. from machine tools after use; pick up after yourself and return tools to their proper storage area.
- Wear closed toe shoes and appropriate clothing.
- Don't run, push or surprise other students. No horse play will be tolerated
- Don't eat, drink, or smoke, in the laboratory

- Always listen carefully to the teacher and follow instructions.
- Do not run in the workshop, you could „bump “into another pupil and cause an accident.
- Know where the emergency stop buttons are positioned in the workshop. If you see an accident at the other side of the workshop you can use the emergency stop button to turn off all electrical power to machines.
- Always wear an apron as it will protect your clothes and hold loses clothing such as ties in place.
- When attempting practical work all stools should be put away.
- Bags should not be brought into a workshop as people can trip over them.
- When learning how to use a machine, listen very carefully to all the instructions given by the teacher. Ask questions, especially if you do not fully understand.
- Do not use a machine if you have not been shown how to operate it safely by the teacher.
- Always be patient, never rush in the workshop.
- Always use a guard when working on a machine.
- Keep hands away from moving/rotating machinery.
- Use hand tools carefully, keeping both hands behind the cutting edge.
- Report any damage to machines/equipment as this could cause an accident.

SYLLABUS

ME3367 MANUFACTURING TECHNOLOGY LABORATORY – 1 L T P C
0 0 3 2

OBJECTIVE:

To Study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.

LIST OF EXPERIMENTS

Machining and Machining time estimations for:

1. Taper Turning operation and Machining time estimations for taper turning operation
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling operation and Machining time estimations for knurling operation
6. Square Head Shaping
7. Hexagonal Head Shaping
8. Fabrication of simple structural shapes using Gas Metal Arc Welding
9. Joining of plates and pipes using GMA / SAW welding
10. Preparation of green sand moulds
11. Manufacturing of simple sheet metal components using shearing and bending operations
12. Manufacturing of sheet metal components using metal spinning on a lathe

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon the completion of this course the students will be able to

1. Manufacture the work piece as per given shape and size using lathe
2. Demonstrate the safety precautions exercised in the mechanical workshop
3. Create the work piece as per given shape and size using machining processes such as shaping, drilling and milling
4. Make sheet metal components like tray and funnel
5. Formulate the moulding, sand moulds using tools, patterns.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

S. NO	NAME OF THE EQUIPMENT	QTY
1.	Centre Lathes	7 Nos.
2.	Horizontal Milling Machine	1 No
3.	Vertical Milling Machine	1 No
4.	Shaper	1 No
5.	Arc welding transformer with cables and holders	2 Nos.
6.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit	1 No
7.	Moulding table, Moulding equipment	2 Nos.
8.	Sheet metal forming tools and equipment	2 Nos.

CO –PO and CO – PSO MAPPING

ME3367	PROGRAM OUTCOMES												PSO's			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3						1		2			1	1	2	2	
CO2	3						1		2			1	1	2	2	
CO3	3						1		2			1	1	2	2	
CO4	3						1		2			1	1	2	2	
CO5	3						1		2			1	1	2	2	
Average	3						1		2			1	1	2	2	

(1-LOW, 2-MEDIUM, 3- HIGH)

CONTENT

EX. NO.	DATE	EXERCISE	PAGE NO.	STAFF SIGN.
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LIST OF EXPERIMENTS

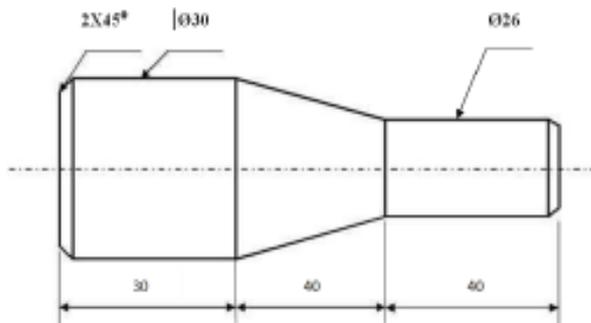
1. Perform Taper Turning Operation in the given work piece Using Compound rest swivelling method and Estimate the total machining time.
2. Carry out External Thread cutting and Internal Thread Cutting in the given work pieces and calculate the total machining time.
3. Perform Eccentric Turning in the given work pieces and calculate the total machining time.
4. Perform knurling operation on the given work piece and calculate the total machining time.
5. Perform square shape block on the given round work piece by using a shaper as per the given dimensions.
6. Perform Hexagonal shape block on the given round work piece by using a shaper machine as per the given dimensions.
7. Fabrication of simple structural shapes(Assembly of pipes) using Gas Metal Arc Welding
8. Joining of given plates and pipes using Gas Metal Arc Welding.
9. Preparation of Green sand moulds.
10. Manufacturing of Funnel in the sheet metal using shearing and bending operations.
11. Manufacturing of sheet metal components using metal spinning.

CONTANT BEYOND SYLLABUS

1. Perform internal square shape block on the given round work piece by using a slotting machine as per the given dimensions

TAPER TURNING

JOB DRAWING



All dimensions are in mm

Materials Supplied: Mild Steel Rod Ø25x 102mm

Tool Material: High Speed Steel (H.S.S)

Model Calculation:

$$\theta = \tan^{-1} \left[\frac{D - d}{2L} \right]$$

Where:

D = Major diameter of the work

piece d = Minor diameter of the work

piece L = Length of the workpiece

$$Time\ for\ turning = \frac{length\ of\ job\ to\ turned}{\frac{Feed}{Rev} \cdot r.p.m} \text{ min.}$$

Ex. No.: 1

Date:

Perform Taper Turning Operation in the given work piece Using Compound rest swivelling method and Estimate the total machining time.

Aim:

To machine the given cylindrical rod as per the diagram, by using the lathe machine.

Tools required:

- a. Chuck Key
- b. Tool post spanner
- c. Turning tool
- d. Chamfering tool
- e. Vernier calliper
- f. Steel rule

Procedure:

1. The work piece is held in the lathe chuck
2. The tool is set at lathe axis
3. The work piece is rotated about lathe axis
4. The facing and plain turning operations are carried out to the required dimensions
5. The step is machined at the end of the work piece
6. The carriage is clamped on the bed at required place.
7. The compound rest base is swivelled to the required taper angle and it is tightened
8. By moving the cross slide the angular feed is given the required dimensions.
9. The taper cylindrical surface is machined
10. Then both ends of the job are chamfered by chamfering tool.

Result:

The given work piece machined as per the diagram by using the lathe machine.

Viva questions

1. State the various methods for taper turning operation.

- 1) Form tool method.
- 2) Tailstock set over method.
- 3) Compound rest method.
- 4) Taper turning attachment method.

2. State the important requites of capstan and turret lathe.

- 1) Bed
- 2) Head stock.
- 3) Turret head
- 4) Saddle and Cross slide.

3. What type of mechanism is used for indexing the turret head for the next operation?

Geneva or Indexing mechanism.

4. Name any four work holding devices.

- 1) Collets
- 2) Chucks
- 3) Fixtures
- 4) Power chucks

5. Name any four tool holding devices

- 1) Multiple cutter holder.
- 2) Offset cutter holder.
- 3) Sliding cutter holder.
- 4) Knee tool holder.

6. What is the use of Mandrels?

Mandrels are used for holding hollow work pieces.

7 Define steady and follower rest.

1. Steady rest:-
2. It is fixed on bed ways of the lathe by .clamping the bolts.
3. Follower rest: -
4. The saddle is mounted on the saddle and moves together with the tool.

8. What are the different operations performed on a lathe?

1. Centering
2. Rough turning
3. Shoulder turning
4. Chamfering

5. Straight turning
6. Finish turning
7. Facing
8. Knurling etc.

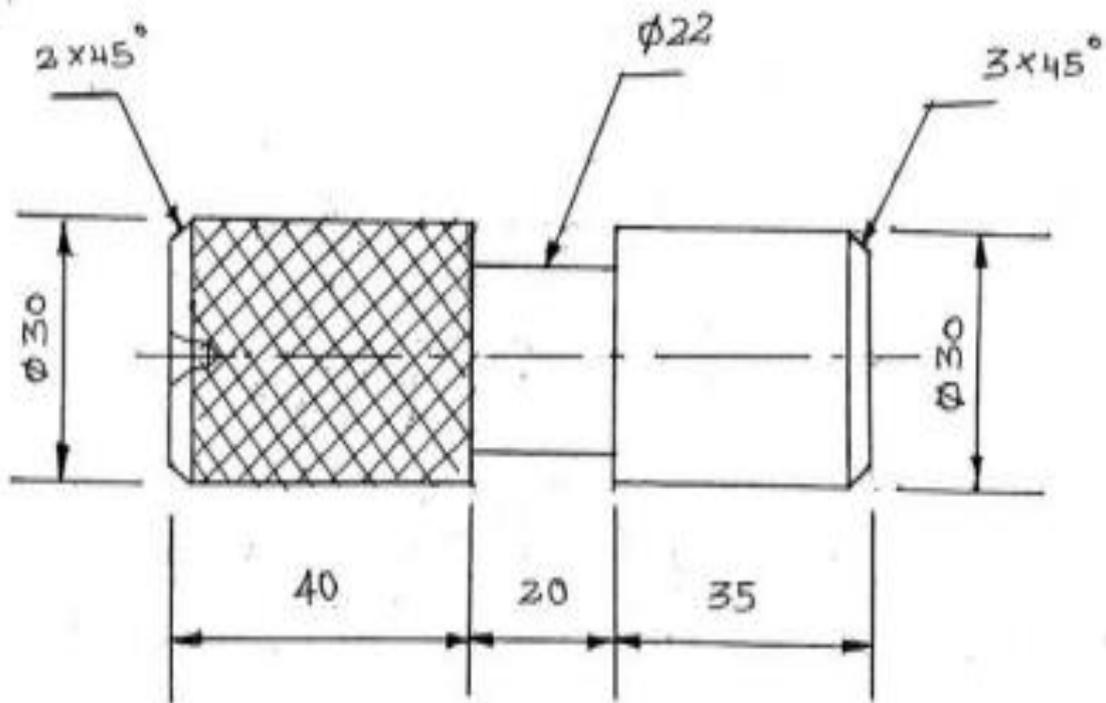
9. Define filing operation.

Filing is the process of removing bars, sharp corners and feed marks on a work piece by removing Very small amount of metal.

10. Define the process "grooving".

Grooving is the process of reducing the diameter of the work piece over a very narrow surface.

**KNURLING
OPERATIONS**



**Ex. No.:2 MACHINING A WORKPIECE BY KNURLING OPERATIONS USING
LATHE**

DATE:

Aim:

To perform the knurling operations on the given work piece as per the given dimensions.

Material Required:

- Mild steel rod

Tools Required:

- Lathe
- Steel rule
- Vernier caliper
- Cutting tool
- Scriber
- Chuck key
- Tool post key
- Knurling tool

Procedure:

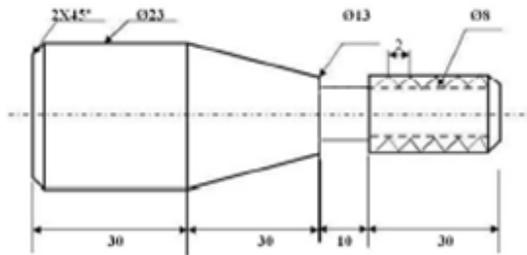
1. The dimension of the given work piece are checked by Vernier caliper.
2. The work piece is held in the lathe chuck properly and it is tightened by chuck key.
3. The cutting tool is set in a tool post such that the point of the cutting tool coincides with the lathe axis.
4. The machine is switched ON to remove the work piece at the selected speed.
5. By the giving cross feed and longitudinal feed to the cutting tool the facing and turning operations are done respectively.
6. The speed of the work piece is reduced.
7. The knurling operation is done by using knurling tool.
8. The work piece is removed from the chuck and all the dimensions are measured and checked.

Result:

Thus the required size and shape of the given work piece is obtained

EXTERNAL THREAD CUTTING

JOB DRAWING



Materials Supplied: Mild Steel Rod $\varnothing 25 \times 102 \text{mm}$

Tool Material: High Speed Steel (H.S.S)

$$\text{Time for thread} = \frac{\text{length of job to turned}}{\frac{\text{Feed}}{\text{Rev}} \cdot \text{r.p.m}} \text{ min.}$$

Gearing ratio= Driver teeth/Driven teeth= TPI to
be cut / TPI on lead screw(inch) Gear ratio= Driver
teeth/Driven teeth= $5P_n/127$ (metric)

Depth of cut = $0.6403 \times \text{pitch}$

Pitch=1/No of TPI

Ex. No.: 3**Date:**

To perform External Thread cutting in the given work pieces and calculate the total machining time.

Aim:

To machine the given cylindrical rod as per the diagram, by using the lathe machine.

Tools required:

- a. Chuck Key
- b. Tool post spanner
- c. Turning tool
- d. Chamfering tool
- e. Vernier caliper
- f. Steel rule

Procedure:

1. The work piece is held in the lathe spindle and it is rotated about lathe axis
2. By adopting usual procedure the facing and plain turning operations are carried out to the required dimensions.
3. Next the taper turning operation is carried out to the required dimensions by compound rest method
4. Then both ends of the job are chamfered by chamfering tool.
5. Remove the chamfering tool and insert the parting tool. Then calculate parting diameter and remove the material as per dimension.
6. The gear ratio is calculated and the suitable size gears are fitted in the change gear train
7. The “V” tool is clamped in the tool post and it is set perpendicular to lathe axis
8. The tool is moved away from job end. After giving suitable depth of cut the half nut is engaged.
9. The required depth of cut is given and the cycle is repeated to obtain the required depth.

Result:

The given work piece machined as per the diagram by using the lathe machine.

Viva questions

1. Classify the relative motion between work piece and cutting tool.
 - a. Rotation of work against the tool. Example: Turning,
 - b. Rotation of tool against work piece. Example: Drilling, Milling,
 - c. Linear movement of the work piece against the tool. Example: Planer,

2. What are all the different types of cutting tool?
 - a. Single point cutting tool,
 - b. Multiply point cutting tool.

3. Classify the various angles in cutting tool?
 - a. Back rake angle
 - b. Side rake angle
 - c. End relief angle
 - d. Side relief angle
 - e. Side cutting angle
 - f. End cutting angle.

4. What is tool signature?

The various angles of tools are mentioned in a numerical number in particular order. That order is known as tool signature.

5. When will the negative rake angles be used?

- a. To machine high strength alloys.
- b. The machine tools are more rigid.
- c. The feed rates are high.
- d. To give heavy and interrupted cuts.

6. Classify the types of metal cutting process?

The metal cutting processes are mainly classified into two types.

- a. Orthogonal cutting process (two dimensional cutting),
- b. Oblique cutting process (Three dimensional cutting).

7. Define orthogonal and oblique cutting?

Orthogonal cutting:-The cutting edge of tool is perpendicular to the work piece axis. Oblique cutting:-

The cutting edge is inclined at an acute angle with normal to the cutting velocity vector is called oblique cutting process.

8. What is shear plane?

The material of work piece is stressed beyond its yield point under the compressive force. This causes the material to deform plastically and shear off. The plastic flow takes place in a localized region is called shear plane.

9. What is cutting force?

The sheared material begins to flow along the cutting tool face in the form of small pieces. The compressive force applied to form the chip is called cutting force.

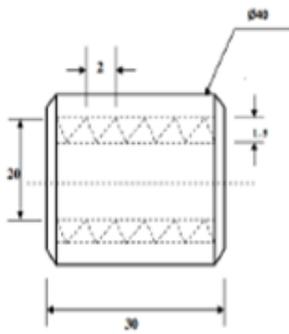
10. What is chip and mention its different types?

The sheared material begins to flow along the cutting tool face in the form of small pieces is called chip. The chips are mainly classified into two types.

- a. Continuous chip.
- b. Discontinuous chip.
- c. Continuous chip with built up edge.

INTERNAL THREAD CUTTING

JOB DRAWING



$$Time\ for\ thread = \frac{length\ of\ job\ to\ turned}{\frac{Feed}{Rev} \cdot r.p.m} min.$$

Gearing ratio= Driver teeth/Driven teeth= TPI to be cut / TPI on lead screw(inch) Gear ratio= Driver teeth/Driven teeth=5Pn/127(metric)

Depth of cut = 0.6403Xpitch

Pitch=1/No of TPI

$$Time\ for\ Boring = \frac{length\ of\ job\ to\ bored}{\frac{Feed}{Rev} \cdot r.p.m} min.$$

Ex. No.: 4

Date:

To perform Internal Thread cutting in the given work pieces and calculate the total machining time.

Aim:

To machine the given cylindrical rod as per the diagram, by using the lathe machine.

Tools required:

- Chuck Key
- Tool post spanner
- Turning tool
- Chamfering tool
- Vernier caliper
- Steel rule

Procedure:

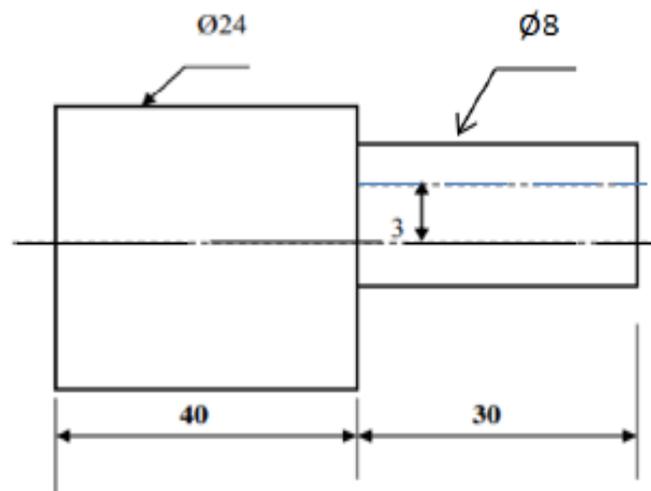
1. The work piece is held in the lathe spindle and it is rotated about lathe axis
2. By adopting usual procedure the facing and plain turning operations are carried out to the required dimensions.
3. Next the taper turning operation is carried out to the required dimensions by compound rest method
4. Then both ends of the job are chamfered by chamfering tool.
5. Remove the chamfering tool and insert the parting tool. Then calculate parting diameter and remove the material as per dimension.
6. The gear ratio is calculated and the suitable size gears are fitted in the change gear train
7. The “V” tool is clamped in the tool post and it is set perpendicular to lathe axis
8. The tool is moved away from job end. After giving suitable depth of cut the half nut is engaged.
9. The required depth of cut is given and the cycle is repeated to obtain the required depth.

Result:

The given work piece machined as per the diagram by using the lathe machine.

ECCENTRIC TURNING

JOB DRAWNG



All dimensions are in mm

Materials Supplied: Mild Steel Rod $\text{Ø}25 \times 102$ mm

Tool Material: High Speed Steel (H.S.S)

$$\text{Time for turning} = \frac{\text{length of job to turn}}{\frac{\text{Feed}}{\text{Rev}} \times \text{r.p.m}} \text{ min.}$$

Ex.no: 5

Date:

Perform Eccentric Turning in the given work pieces and calculate the total machining time.

Aim:

To machine the given cylindrical rod as per the diagram, by using the lathe machine.

Tools required:

- a. Chuck Key
- b. Tool post spanner
- c. Turning tool
- d. Chamfering tool
- e. Vernier caliper
- f. Drill bit $\phi 10\text{mm}$
- g. Steel rule

Procedure:

1. The work piece is held in the lathe spindle and it is rotated about lathe axis
2. The tool is held in the tool post and it is set to lathe axis
3. The facing and turning operations are carried out to the required dimensions
4. Then the axis of the work piece is shifted to the required eccentricity
5. The longitudinal feed is given to the required length and job is eccentrically turned.
6. Two or more cuts with suitable depth of cut are given to obtain required diameter
7. Then both ends of the job are chamfered by chamfering tool.

Result:

The given work piece machined as per the diagram by using the lathe machine.

Viva Questions

1. What are the factors affecting the machinability?
 - a. Chemical composition of work piece material,
 - b. Microstructure of work piece material
 - c. Mechanical properties like ductility, toughness etc.

2. What are all the tool variables affecting the machinability?
 - a. Tool geometry and tool material.
 - b. Nature of engagement of tool with the work.
 - c. Rigidity of tool.

3. What are the machine variables affecting the machinability?
 - a. Rigidity of machine.
 - b. Power and accuracy of the machine tool.

4. How the machinability can be evaluated?
 - a. Rate of removal per tool grind,
 - b. Magnitude of cutting forces and power consumption. Surface finish.
 - c. Dimensional stability of finished work.
 - d. Heat generated during cutting.

5. Mention the advantage of high machinability?
 - a. Good surface finish can be produced,
 - b. High cutting speed can be used,
6. Classify the tool wear?

The tool wear is generally classified as follows,

- a. Flank wear or crater wear
- b. Face wear
- c. Nose wear

7. How tool life is defined?

Tool life is defined as time elapsed between two consecutive tool sharpening. During, this period tool serves effectively and efficiently.

8. What are the factors affecting tool life?
 - a. Cutting speed

- b. Feed and depth of cut
- c. Tool geometry
- d. Tool material
- e. Cutting fluid
- f. Work material
- g. Rigidity of work, tool and machine.

9. Mention the various parts single point cutting tool?

- a. Shank
- b. Face
- c. Flank
- d. Base
- e. Nose
- f. Cutting edge.

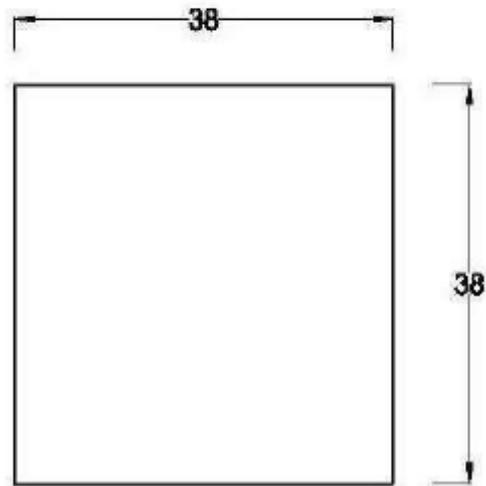
10. What are purposes of chip breakers?

The chip breakers are used to break the chips into small piece for removal, safety and to prevent to machine and work.

SQUARE HEAD SHAPING

Ex. No.:

JOB DRAWNG



All dimensions are in mm

Materials Supplied: Mild steel: ϕ 40mmX25mm

Tool Material: High Speed Steel (H.S.S)

Ex. No: 6

Date:

Perform square shape block on the given round work piece by using a shaper as per the given dimensions

Aim

To machine the given circular block in the shaping machine.

Tools required:

- a. Chuck Key
- b. Tool post spanner
- c. Turning tool
- d. Chamfering tool
- e. Vernier caliper
- f. Drill bit $\phi 10\text{mm}$

Procedure:

1. The given raw material block is measured. The machining allowances are noted. Then the job is coated with white chalk for marking purpose.
2. The job is position in the marking table. The vernier height gauge is set to the correct dimensions as per the part drawing dimensions
3. After, the height in mm is corrected in the vernier height gauge; the vernier scriberis marked in the face sides of the block.
4. To identify the dimensions of the job, the marking lines are punched
5. The work piece is placed in the shaping machine work holding device incorrect position. Tool is held in the head in suitable position.
6. The stroke length and initial cutting position are corrected by adjusting the ram and table manually
7. The tool is held in the tool post in vertical position
8. Now, the machine is switched ON. The tool moves over the work, the materials is removed from the work by the tool cutting force.
9. By giving cross-feed movement to the table, the total length of work is machined, after completion of one cut, the depth of cut is adjusted in the tool head. Then the next cut is taken.
10. By repeating the above same procedure, the other faces are machined to the required dimensions
11. After completion of six faces, the work is removed from the vice, cleaned and inspection is carried out. The job No / Roll No are punched in the face side of the work.

Result

The given work piece is machined as per the dimension in the shaping machine.

Viva questions:

1. What is shaper?

The shaper is a reciprocating type of machine tool intended to produce flat surface. These Surfaces may be horizontal, vertical or inclined.

2. Classify the shaper according to the reciprocating of ram.

- a. Crank type,
- b. Hydraulic type,
- c. Geared type.

3. Classify the shaper according to the travel and position of the ram

- a. Horizontal type,
- b. Vertical type,
- c. Traveling head type.

4. Classify the shaper according to the design of table

- a. Standard type,
- b. Universal type.

5. Classify the shaper according to the type of cutting stroke

- a. Push type,
- b. Draw type

6. List the different types of parts involved in the shaper

- a. Base,
- b. Column,
- c. Cross rail,
- d. Saddle,
- e. Table,
- f. RAM
- g. Tool head.

7. List the parts in tool head.

- a. Swivel base,
- b. Vertical slide
- c. Apron,
- d. Tool post

8. List the parts in apron.

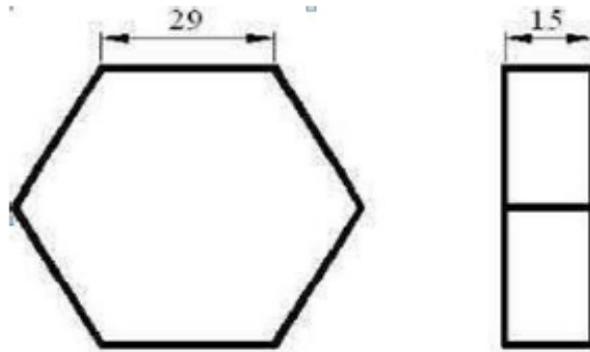
- a. Clapper box,
- b. Clapper block
- c. Tool post

9. What are the different types of mechanism used in shaper?

- a. Crank and slotted Mechanism
- b. Whit worth mechanism
- c. Hydraulic shaper mechanism

HEXAGONAL HEAD SHAPING

JOB DRAWNG



All dimensions are in mm

Materials Supplied: Mild steel: $\varnothing 40\text{mm} \times 20\text{mm}$

Tool Material: High Speed Steel (H.S.S)

Ex. No: 7

Date:

Perform hexagonal head shaping on the given round work piece by using a milling machine as per the given dimensions.

Aim:

To machine a hexagon shape in the given work piece to the dimensions as shown in the figure using Milling Machine

Tools Required:

- a. Milling Machine,
- b. Scriber, Divider,
- c. Steel Rule,
- d. Chalk piece,
- e. Bevel Protractor.

Procedure:

1. The given work piece is measured for its initial dimensions.
2. With the help of scriber, mark the hexagon dimensions in the workpiece.
3. Fix the work piece in the vice of the Milling machine.
4. After fixing the work piece and the shaping tool, allow the ram to reciprocate.
5. Start the shaping process by giving the required depth by lowering the tool.
6. Slowly increase the depth of cut and repeat the procedure to make the hexagon shape.
7. The work piece is now checked for final dimensions.

Result:

Thus, a hexagon is machined in the given work piece to the dimensions as shown in the figure using a milling machine.

Viva questions:

1. What is the type of milling machines?

- a. Column and knee type milling machine,
- b. Manufacturing of fixed table type.
- c. Planer type,
- d. Special type.

2. What are the special attachments made in the universal milling machine?

- a. Dividing head
- b. Vertical milling attachments,
- c. Rotary attachment
- d. Twist drill
- e. Reamer

3. What is vertical milling machine?

In vertical milling machine the spindle is mounted vertical or perpendicular to the table.

4. What are the parts used in the column and knee type milling machine?

- a. Base
- b. Column
- c. Knee
- d. Table
- e. Over hanging arm
- f. Front brace
- g. Arbour

5. Write any four advantages of milting gears?

The advantages of milling gears are:

- a. All types of gears i.e. spur, helical, worm, bevel are possible and easy to cut.
- b. Both roughening and finishing operations can be easily done and fine surface finish can be obtained.
- c. It is useful for any tooth form
- d. Initial cost is low

6. Where is the form of relieved convex involute gear used?

Involute gear cutter is used in forming of gear in milling machine.

7. Give any three differences between gear hobbing and gear milling?

- a. Gear Hobbing:
- b. Hob operates on several teeth at a time.
- c. It is not necessary to disengage cutter and work before indexing. Gear Milling:
- d. Milling machine can cut only one tooth at a time.
- e. It requires cutter and work to get disengaged before indexing can occur.

8. What is meant by up-milling (conventional milling),

The feed direction of the cutting tool is opposite to its rotation

9. What is meant by down-milling (climb milling),

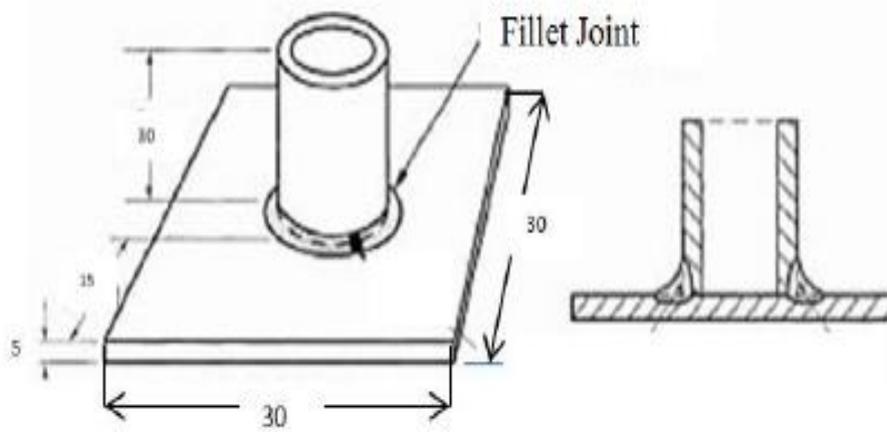
The cutting tool is fed with the direction of rotation.

10. Types of milling cutters

- a. End mill
- b. Roughing end mill

JOINING OF PLATE WITH PIPE

JOB DRAWNG



ALL DIMENSIONS ARE IN mm

Ex. No: 8

Date :

Joining of given plates and pipes using Gas Metal Arc Welding.

Aim:

Joining of plate with pipe on the given Plate and pipe using arc welding.

Apparatus required:

Work pieces, Welding electrodes, MIG Welding machine, Tongs, Wire brush, chipping hammer, Gloves and Goggles.

Procedure:

1. The given work pieces are cleaned with the wire brush to remove the rust, scale and other impurities.
2. Edges are prepared suitably to the given dimension and positioned one over another for the Plate and pipe joint.
3. Depending upon the thickness of the parent metal, the amperage and correct voltage is selected.
4. With goggles covering the eyes and gloves on hands, an arc is struck on the work piece and tacks are made at the extreme ends.
5. Welding process is progressed along the seam at a constant speed and keeping uniform distance between the electrode and the work piece.
6. Using chipping hammer the flux in the form of slag is chipped off and then cleaned.
7. After welding, the work pieces should be handled only using the tongs.

Result:

Thus the required Plate and pipe joining is obtained as per the given dimensions.

VIVA QUESTIONS AND ANSWERS

1. Which welding process uses non-consumable electrodes?

TIG welding

2. What is gas welding?

Mixture of gases is used to produce high temperature flame.

3. What is filler material?

It is the material added to the weld pool to assist in filling the gap.

4. What is flux?

Flux avoids oxidation in welding flame by giving a cover.

5. What are the advantages of using LPG over acetylene for cutting?

LPG fuel produces rich flame for cutting process.

6. Which equipment is used to supply power for welding?

Welding transformer

7. What is over head welding?

Welding done at the top of welding booth is called overhead welding.

8. What are the applications of welding?

Fabrication of steel windows and rods.

9. What is flux change in welding?

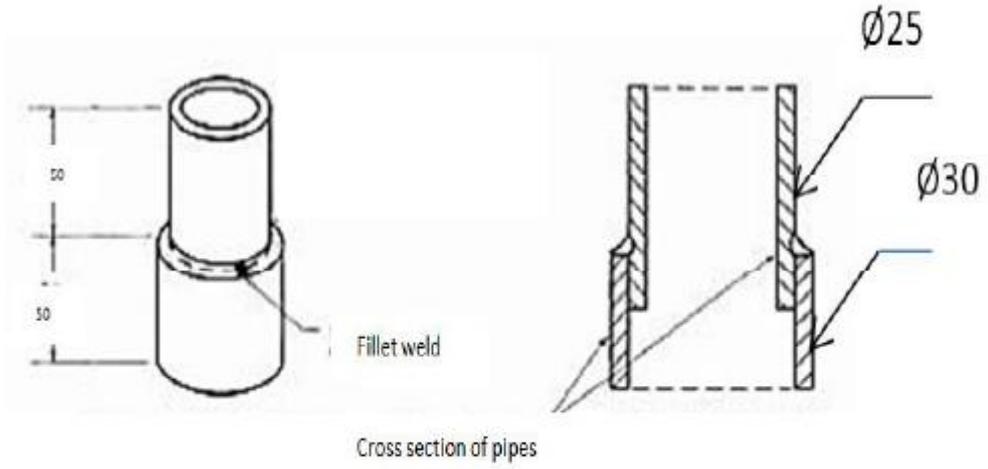
Flux change is done to switch from one type of welding to other.

10. What are the advantages of using electric arc welding?

EAW can be done without the use of oxygen cylinder.

ASSEMBLY OF PIPES

JOB DRAWNG



Ex. No: 9

Date:

**Fabrication of simple structural shapes (Assembly of pipes) using Gas Metal Arc
Welding**

Aim:

To make a pipe assembly on the given work pieces using arc welding.

Apparatus required:

Work pieces, Welding electrodes, MIG Welding machine, Tongs, Wire brush, chipping hammer, Gloves and Goggles.

Procedure:

1. The given work pieces are cleaned with the wire brush to remove the rust, scale and other impurities.
2. Edges are prepared suitably to the given dimension and positioned at right angles for the tee joint.
3. Depending upon the thickness of the parent metal, the amperage and correct voltage is selected.
4. With goggles covering the eyes and gloves on hands, an arc is struck on the work piece and tacks are made at the extreme ends.
5. Welding process is progressed along the seam at a constant speed and keeping uniform distance between the electrode and the work piece.
6. Using chipping hammer the flux in the form of slag is chipped off and then cleaned.
7. After welding, the work pieces should be handles only using the tongs.

Result:

Thus the required pipe assembly is obtained as per the given dimensions using arc welding.

VIVA QUESTIONS AND ANSWERS

1. What is arc welding?

Electric arc is produced between carbon electrode and work piece to produce heat.

2. What is electrode?

Filler rods used in arc welding are called electrodes.

3. Name the materials used for coating on electrodes.

Copper, Carbon and Graphite.

4. What are the types of resistance welding?

Spot welding, Projection welding and Butt welding.

5. What are the welding defects?

Undercut, Cracking and Incomplete penetration.

6. What is coating done on electrode surface?

Coating is done to avoid melting of electrode

7. What is butt joint?

Work pieces are welded to either sides.

8. What is lap joint?

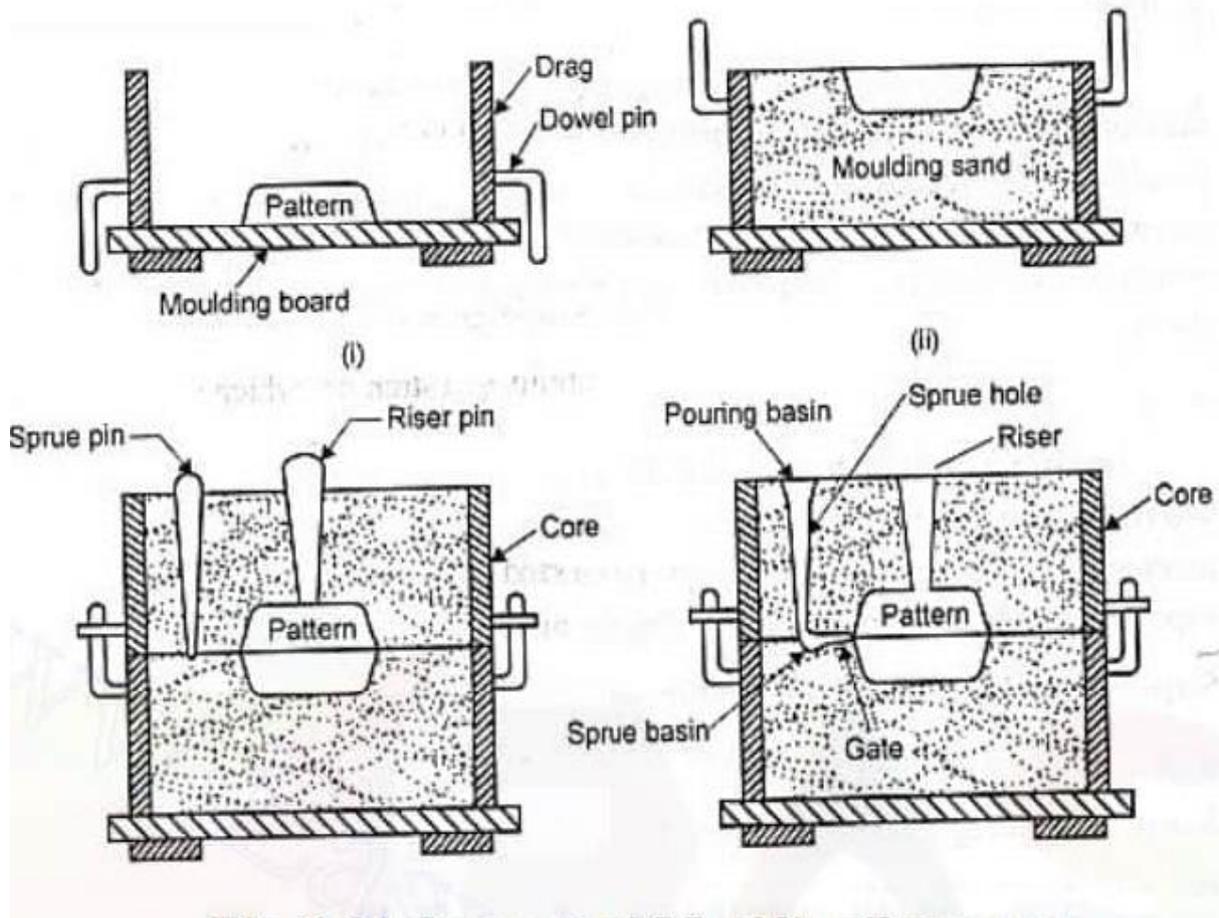
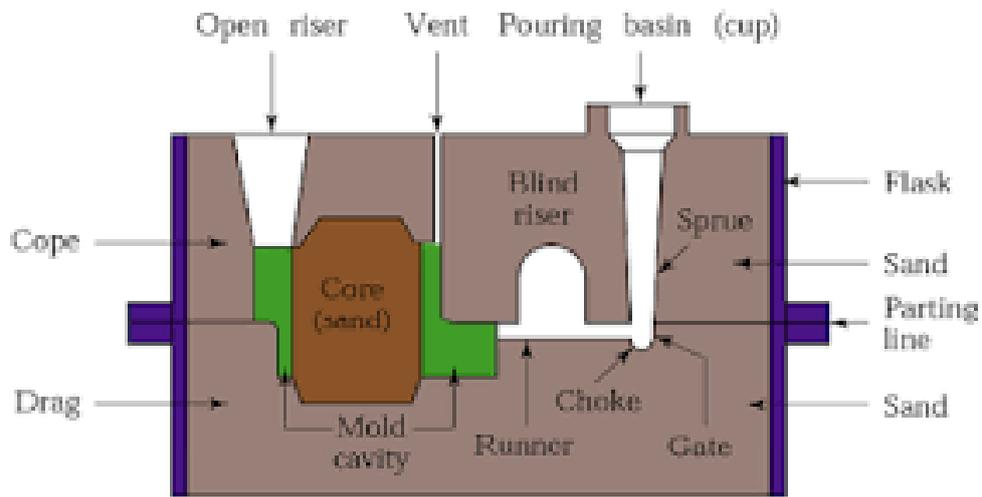
Work pieces are welded one over other.

9. What is T-joint?

Work pieces are welded at perpendicular to each other.

10. What is corner joint?

Work pieces are welded at the corners.



Ex. No:10**Date:****Preparation of green sand moulds****Aim**

1. To prepare a pattern for given object for lost form casting.
2. To prepare a molasses sand mold from the prepared pattern.
3. To melt and pour iron metal into the mold.

Equipment and Materials

Pattern, core box, molding flasks, molding tools, sand muller, riddle, sand, molasses, bentonite, core baking oven, thermocole, melting furnace, fluxes, pouring ladle, pyrometer, hacksaw, file.

Procedure Core making

1. Prepare the core sand
2. Assemble (clamp) the core-box after applying some parting sand
3. Fill the core box cavity with core sand and ram it
4. Make vent holes or insert reinforcing wire as desired
5. Tap the mold box on all sides to loosen the core from the box, unclamp the core box and carefully transfer the core on to a baking plate or stand.

Mold Making

1. Place the drag part of the pattern with parting surface down on ground or molding board at the center of the drag(flask).
2. Riddle molding sand to a depth of about 2 cm in the drag and pack this sand carefully around the pattern with fingers.
3. Heap more molding sand in the drag and ram with rammer carefully.
4. Strike off the excess sand using strike bar.
5. Make vent holes to within 1 cm of the pattern surface in the drag.
6. Turn this complete drag and place the cope portion (flask) over it.
7. Place the cope half of the pattern over the drag pattern matching the guide pins and apply parting sand over the parting surface. Also place the sprue pin and riser pin in proper positions.
8. Complete the cope half by repeating steps (2) to (5).

9. Remove the sprue and riser pins and make a pouring basin. Separate the cope and drag halves, and place them with their parting faces up.
10. Moisten sand at the copes of the pattern and remove pattern halves carefully using draw spikes.
11. Cut gate and runner in the drag. Repair and clean the cavities in the two mold halves.
12. Place the core in position, assembled the two mold halves assemble and clamp them together.

Melting and Pouring

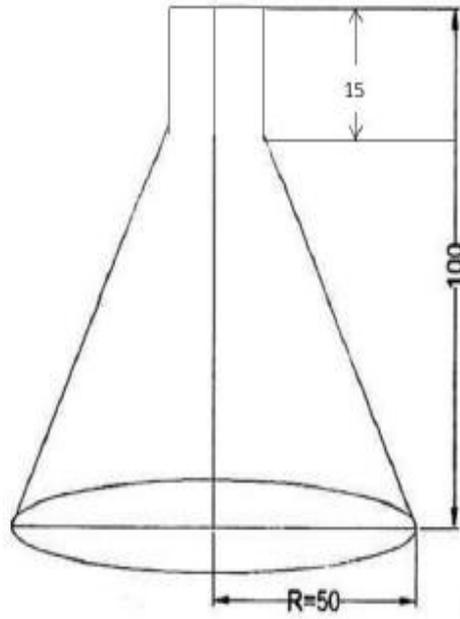
1. Melt the metal in the furnace. Use appropriate fluxes at proper stages and measure metal temperature from time to time.
2. Pour the molten metal into the pouring ladle at a higher temperature (say 100°C higher) than the pouring temperature. As soon as the desired pouring temperature is reached, pour the liquid metal into the mold in a steady stream with ladle close to the pouring basin of the mold. Do not allow any dross or slag to go in.
3. Allow sufficient time for the metal to solidify in the mold. Break the mold carefully and remove the casting.
4. Cut-off the riser and gating system from the casting and clean it for any sand etc.
5. Inspect the casting visually and record any surface and dimensional defects observed.

Result:

Thus the mould cavity of given solid, split pattern is obtained

FUNNEL MAKING

JOB DRAWNG



Ex.no:11

Date:

Manufacturing of Funnel in the sheet metal using shearing and bending operations.

Aim:

To make a funnel of the given sheet with specified dimensions.

Tools required:

1. Sheetmetal
2. Anvil
3. Try square
4. Steelrule
5. Divider
6. Snip
7. Scriber
8. Mallet
9. File
10. Hand shearingmachine
11. Protractor etc.

Materials required:

Tin or mild steel of suitable size.

Procedure:

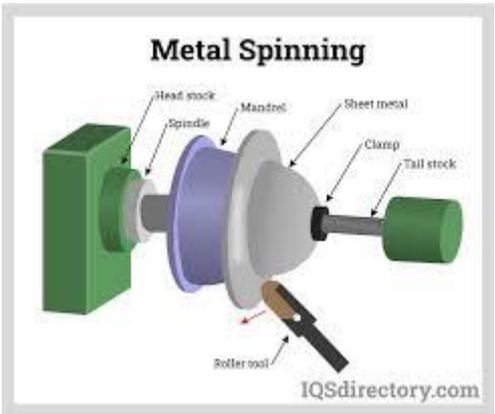
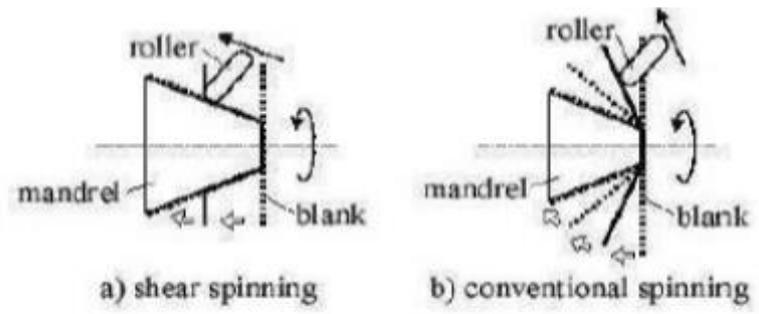
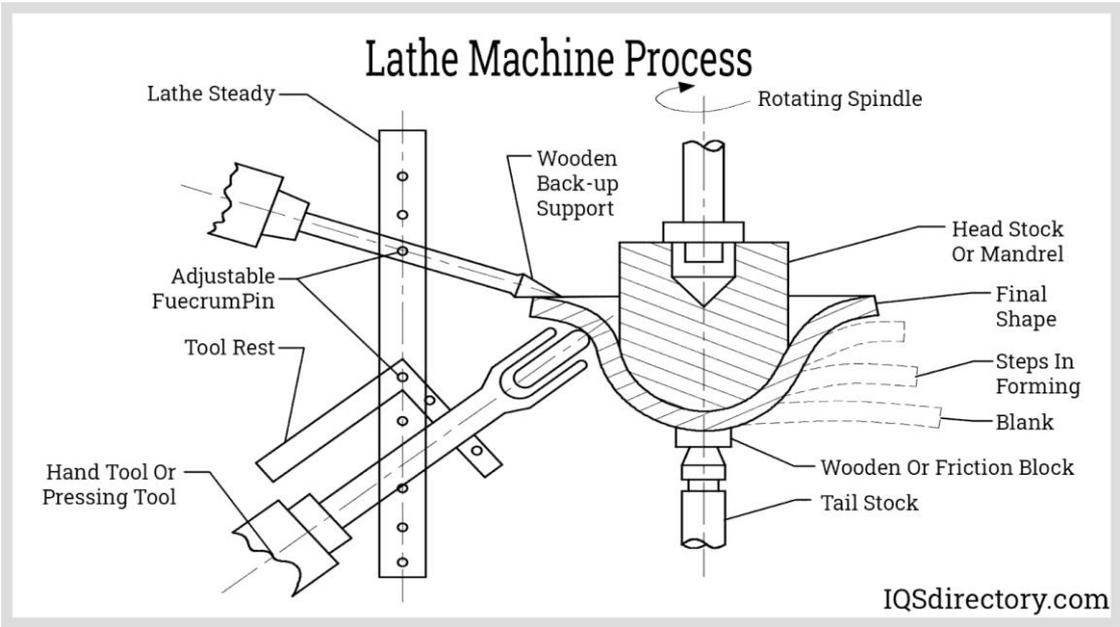
1. Development of cone for the given dimensions is drawn on the provided sheet metal using protractor and scriber. (Sector of radius equal to the slant length of the cone and arc length equal to the circumference of the cone)
2. Assume, joining allowance of 10 to 15mm on either side of the development.
3. The sheet metal is exactly cut as per the markings made on it using a straight shear / snip. The burrs are removed using a file.
4. Then the edges are bent for a length of joining allowance. This is done with the help of a mallet and an appropriate stake / anvil.
5. The sheet metal is then formed to the conical shape using a cylindrical stake / anvil and a mallet as shown in fig.
6. Now the bent edges are made to overlap each other and are struck with a mallet to get the required joint.

Result:

Thus the cone of given dimension is fabricated with the given sheet metal.

VIVA QUESTIONS AND ANSWERS

1. What is sheet metal work?
Sheet metal work is used for making, Cutting and bending of sheet metals to desired shape.
2. Which are the materials used for sheet metals?
 - a. Galvanized iron
 - b. Stainless steel
 - c. Copper
 - d. Aluminium
3. Name the sheet metal hand tools.
 - a. Steel rule
 - b. Vernier calliper
 - c. Micrometer
 - d. Scriber
 - e. Divider
 - f. Hammer
 - g. Mallet
 - h. Shears
4. What is G.I.?
G.I. stands for galvanized iron
5. What is shearing?
Shearing means sheet metal cutting
6. What is the name of vice used in fitting shop?
Bench vice
7. Name the different files?
 - a. Flat file
 - b. Square file
 - c. Round file
 - d. Triangular file
 - e. Half round file
8. What are the metals that can be used for sheet metal work?
Aluminium, Brass, Copper and steel.
9. What are the cutting tools?
Straight snip and Curved snip
10. What is Curved snip?
Curved blades are used for making circular cuts.



Ex. No: 12

Date :

Manufacturing of sheet metal components using metal spinning.

Aim:

To produce the component in sheet metal as per the required shape and dimensions.

Apparatus Required:

Metal Spinning lathe, Sheet metal blank, Mandrel, follower, Spinning tool.

Procedure:

1. The blank is clamped between spinning mandrel and a follower on the tailstock spindle.
2. The mandrel, blank, and follower are then set in rotation at controlled speeds.
3. Spinning tools or spinning rollers are forced against the rotating blank either by hand or by auxiliary power or both.
4. Employing a series of axial and radial (swivel) strokes, the blank is spun onto the mandrel causing the metal to flow to the shape of the desired part.

Result:

Thus the component of the required shape is made by metal spinning process.