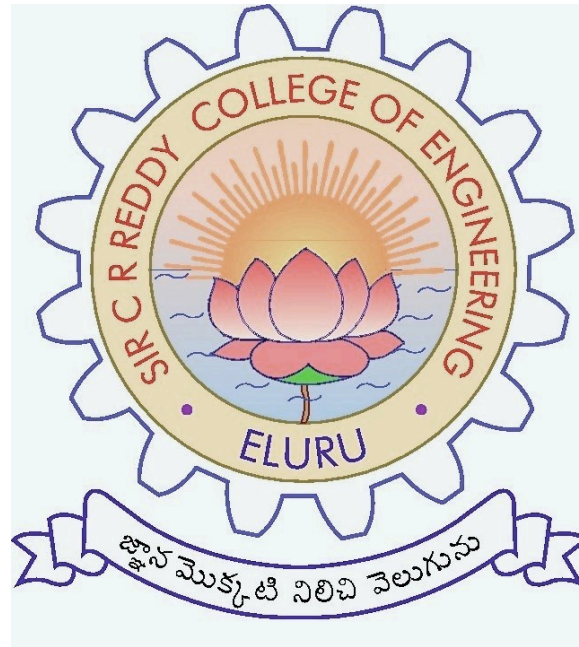


SIR C.R.REDDY COLLEGE OF ENGINEERING
ELURU-534 007

MANUFACTURING TECHNOLOGY LAB-I
MANUAL



DEPARTMENT OF MECHANICAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

MANUFACTURING TECHNOLOGY LAB-I

LIST OF EXPERIMENTS

Sl.No.	Name of the Experiment	Page No.
1	STEP & TAPER TURNING	2
2	THREAD CUTTING	4
3	KNURLING & ECCENTRIC TURNING	7
4	V-GROOVE ANGLE	9
5	SPUR GEAR MILLING	11
6	DUMBELL	16
7	HANDLE	18
8	CONNECTING ROD	20
9	LAP JOINT	22
10	SQUARE BUTT JOINT	23
11	T-JOINT	25
12	CORNER JOINT	27
13	CONVERSION OF ROUND TO SQUARE	29
14	RING AND HOOK	31

1.STEP AND TAPER TURNING

AIM: To perform facing, plain turning, step turning and taper turning on a given work piece of mild steel as per dimensions given in the figure.

TOOLS REQUIRED:

- 1) Marking Block
- 2) Tool key
- 3) Chuck key
- 4) Single point cutting tool

MEASURING INSTRUMENTS REQUIRED:

- 1) Steel rule
- 2) Out – side calipers
- 3) Vernier caliper

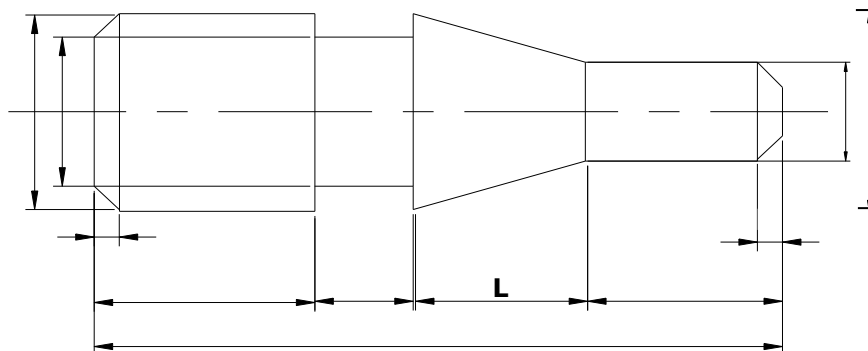
MATERIAL REQUIRED:

A mild steel rod of length 100 x ϕ 25mm piece

OPERATIONS:

- 1) Fixing the job on the chuck
- 2) Fixing the cutting tool in tool post
- 3) Facing
- 4) Plane turning
- 5) Step turning
- 6) Taper turning
- 7) Chamfering

FIGURE:



PROCEDURE :

1. With the help of marking block and chuck key, the job is fixed in the chuck so that the axis of job coincides with the axis of lathe.
2. The single point cutting tool is fixed on the tool post and sufficiently tightened with spanner.
3. Facing is done by giving cross feed with cross slide at one end.
4. Plain turning is done by giving longitudinal feed with carriage up to possible length of the job.
5. The required taper angle is maintained by swiveling the compound slide.
6. The required chamfer is maintained.
7. The job is reversed & operations are repeated.
8. Required dimensions as per figure are maintained with accuracy using out side calipers, steel rule and Vernier calipers.
9. Chamfer is made as per figure.

TAPER ANGLE CALCULATIONS:

$$\tan \alpha = \frac{D - d}{2L}$$

Where α = Half taper angle

D = Major diameter of the work piece in mm

d = Minor diameter of the work piece in mm

L = Length of the taper in mm.

PRECAUTIONS :

1. The job is tightly fixed in the chuck.
2. The cutting tool should be held rigidly on the tool post.

RESULT : Required job of given dimensions & shape is obtained.

VIVA QUESTIONS

1. What are the various methods of turning a taper?
2. Name some of the advantages of using a 'taper turning attachment'?
3. What are the advantages of using a collet chuck?
4. Explain the working of a Mandrel?
5. What do you mean by turning?
6. What is the use of steady rest?
7. What is the difference between 3jaw chuck & 4jaw chuck? What are its applications?
8. List out parts of a Lathe?

2.THREAD CUTTING

AIM : To perform facing , plain turning, step turning and thread cutting on a given work piece of mild steel as per dimensions given in the figure.

TOOLS REQUIRED :

- 1) Marking Block
- 2) Tool key
- 3) Chuck key
- 4) Single point cutting tool
- 5) Thread cutting tool

MEASURING INSTRUMENTS REQUIRED:

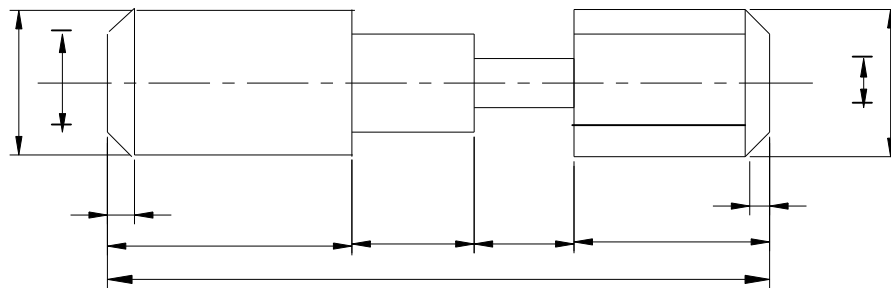
- 1) Steel rule
- 2) Out – side calipers
- 3) Vernier calipers
- 4) Pitch Gauge

MATERIAL REQUIRED : A mild steel rod of length 100 x ϕ 25mm piece

OPERATIONS :

- 1) Fixing the job in the chuck
- 2) Fixing single point cutting tool in the tool post
- 3) Facing
- 4) Plain turning
- 5) Step turning
- 6) Thread cutting

FIGURE:



PROCEDURE :

1. With the help of marking block and chuck key, the job is fixed in the chuck so that the axis of job coincides with the axis of the lathe.
2. The cutting tool is fixed in the tool post with spanner.
3. Facing is done by giving cross feed with cross slide at one end.
4. Marking is done along the work piece where steps are to be made.
5. By giving longitudinal feed and depth of cut steps are made according to dimensions.
6. For doing thread cutting speed of work should be as low as possible. It is done by changing pulley belts and by engaging back gear.
7. In the gear train we have to arrange suitable gear wheels for setting the required pitch using the formula given below.
8. By engaging the lead screw and half nut the thread cutting tool is made to move as per the pitch of the work piece on the job and required threading is done as per the figure.
9. Using pitch gauge the obtained threading is inspected.
10. Chamfer is made as per the figure.
11. The job is reversed and facing, plain turning and step turning is done as per the required dimensions using steel rule, outside calipers and vernier calipers as shown in the figure
12. Chamfer is made as per the figure.

CHANGE GEAR CALCULATIONS:

$$\frac{\text{Driver teeth}}{\text{Driven teeth}} = \frac{5pn}{127}$$

Where P = Pitch of the work piece to be made in mm.

And n = Pitch of the lead screw in mm

PRECAUTIONS :

1. The job & the tool should be fixed tightly in the chuck & tool post respectively.
1. During operations work piece & tool should not be touched by hand.
2. Proper care should be taken so that the tool should not touch the chuck.
3. During thread cutting operation sufficient coolant oil should be poured to cool the work piece and tool.

RESULT : The job of required dimensions is obtained as per figure.

VIVA QUESTIONS

1. Explain how the back gears operate?
2. When is the split nut or half nut used?
3. What is a centre gauge used in threading?
4. What is meant by chamfering?
5. What type of operations should be performed before thread cutting operation?
6. Why do you use coolant during thread cutting?
7. What are the precautions should take during thread cutting?
8. Explain gear calculations?
9. How do you inspect threading?

3.KNURLING & ECCENTRIC TURNING

AIM: To perform facing, plain turning, step turning, knurling and eccentric turning on a given work piece of mild steel as per dimensions given in the Fig.

TOOLS REQUIRED:

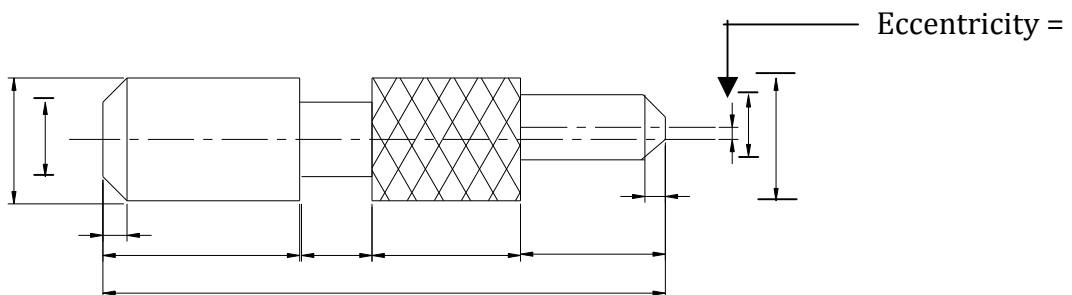
- 1) Steel rule
- 2) Marking Block
- 3) Out – side calipers
- 4) Tool key
- 5) Chuck key
- 6) Vernier calipers
- 7) Single point Cutting tool

MATERIAL REQUIRED : A mild steel rod of length 100mm x ϕ 25mm piece.

OPERATIONS :

- 1) Fixing the job in the chuck
- 2) Fixing cutting tool in the tool post.
- 3) Facing
- 4) Plane turning
- 5) Step turning
- 6) Knurling
- 7) Eccentric turning
- 8) Chamfering

FIGURE:



PROCEDURE :

1. Fix the job piece in the chuck so that axis of the job and axis of the chuck coincides with the help of chuck key and marking block.
2. Fix the single point cutting tool in the tool post using tool key.
3. Facing operation is done and plain turning is performed for the major diameter as per figure.
4. By giving longitudinal feed and depth of cut steps are made as per figure.
5. Fix the knurling tool in the tool post.
6. The cutting speed of the job is reduced by changing the pulley belts and by engaging back gear.
7. Knurling operation is performed as per figure.
8. Chamfering is done as per the figure.
9. Remove the job from the chuck.
10. Marking is done by applying chalk on the second side face of the job using outside calipers and dot punch.
11. Shift the axis of the work piece as per the required eccentricity as per figure and mark the eccentric diameter as per figure.
12. Fix the job in the four jaw chuck and center the job such that the center of the eccentric diameter coincides with the lathe axis as per the required eccentricity mentioned in the figure.
13. By giving proper longitudinal feed and depth of cut the required eccentric diameter is obtained.
14. Facing is done to maintain the required length as per figure. Chamfering is made as per figure.

PRECAUTIONS :

- 1) The job is tightly fixed in the chuck.
- 2) The cutting tool should be held rigidly in the tool post.
- 3) In running condition the cutting tool and tool post should not touch chuck.
- 4) Dimensional accuracy is to be machined.
- 5) During knurling operation sufficient lubrication should be done.

RESULT : The job of required dimensions is obtained as per figure.

VIVA QUESTIONS

1. What are the precautionary steps to be taken during knurling operation?
2. What are the applications of knurling?
3. What are the operations should be performed before knurling?
4. What do you mean by eccentric turning?
5. Explain how to reduce the cutting speed?

4.V- GROOVE ON SHAPER

AIM: To prepare a V – groove on the given work piece on shaper machine.

TOOLS REQUIRED:

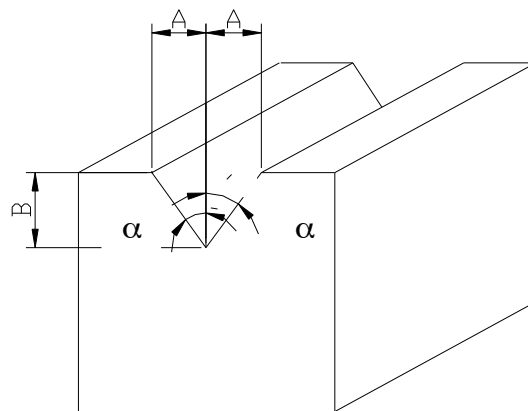
- 1) Single point cutting tool
- 2) Steel rule
- 3) Dot punch
- 4) Hammer
- 5) Vernier caliper

MATERIAL REQUIRED : Cast Iron cube of 100mm.

OPERATIONS :

- 1) Fixing the job in the machine vice.
- 2) Fixing the cutting tool in tool holder
- 3) Machining the surface
- 4) Marking
- 5) Producing V – groove

FIGURE:



$$\tan \alpha = \frac{A}{B} = 1$$
$$\alpha = 45^\circ$$

PROCEDURE :

1. The given work piece is taken and surface is machined on shaper.
2. The required V- groove markings are obtained on the work piece with dot punch as per dimensions mentioned in the figure.
3. The material is removed by moving the table transversely so that cutting tool comes in contact with the work with in the marked region.

PRECAUTIONS :

1. Markings should be made accurately.
2. Material should be removed carefully.

RESULT : The required V – groove is obtained on the work piece using shaper as per figure.

VIVA QUESTIONS

1. What type of Mechanism used in shaper?
2. Explain the difference between shaper and planer?
3. What is the usual ratio of forward and return stroke in shaper?
4. Why shapers equipped with universal table?
5. How to specify the size of a shaper?
6. What are the applications of shaper?
7. How the jobs are held on the table of a horizontal shaper?

5.SPUR GEAR MILLING

AIM: To Perform Spur Gear Milling Operation on the given cast iron round.

TOOLS & ACCESSORIES REQUIRED:

1. In volute gear cutter
2. Universal dividing head
3. Arbor
4. Mandrel
5. Three jaw chuck
6. Live and dead centers

MATERIAL REQUIRED: A cast iron round of ϕ 81 x 20 mm thickness

SEQUENCE OF OPERATIONS:

- 1) Preparation of cast iron round by turning to maintain outside diameter, internal diameter and thickness.
- 2) Mounting of gear cutter on the arbor of milling machine.
- 3) Fixing universal dividing head on the table of milling machine.
- 4) Selection of number of teeth on the required spur gear.
- 5) Spur gear milling
- 6) Simple indexing to next teeth of the gear blank.

FIGURE:

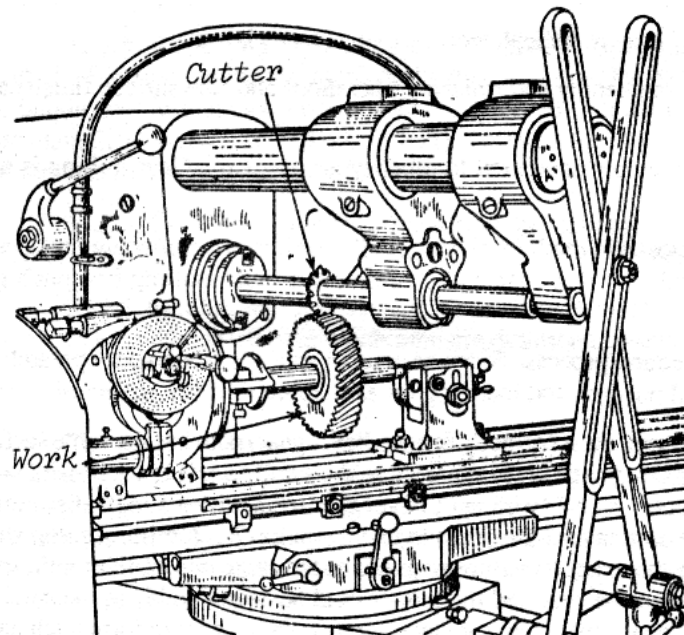


Fig. 31.2

PROCEDURE:

- 1) The actual cutting of spur gear is done after determining the gear tooth proportions, selecting the type of indexing to be performed, and finding the correct number of form cutter.
- 2) The speed and feed of the machine is next set.
- 3) The speed should be slightly lower than the plain milling operation and the feed should be normal.
- 4) The dividing head and the tailstock are next bolted on the table after setting their axis exactly perpendicular to the machine spindle.
- 5) The cutter is next mounted on the arbor and it is then centered accurately with the dividing head spindle axis by adjusting the position of the table.
- 6) The alignment of the cutter with the work axis is checked by raising the table where the centerline of the cutter must touch the center point of the tailstock.
- 7) The gear blank is next mounted between the two centers by a mandrel and is connected with the dividing head spindle by a carrier and a catch plate.
- 8) The proper index plate is next bolted on the dividing head and the positions of the crank pin and the sector arms are adjusted.
- 9) For a smaller size of gear blank, the depth of cut is given equal to the full depth of the gear tooth. For this purpose, the table is raised till the cutter just touches the periphery of the gear blank.
- 10) The micrometer dial of the vertical feed screw is set to zero in this position.
- 11) The table is next raised to give the required depth of cut by turning the dial through the calculated number of divisions.
- 12) The machine is started and the feed is applied to finish the first tooth space of the gear.
- 13) After the end of the cut, the table is brought back to the starting position and then the blank is indexed for the next tooth space.
- 14) The operation is repeated till all the gear teeth are cut.

SPUR GEAR PROPORTIONS:

Name of tooth element	Gear tooth proportions (pressure angle 20°)	Results
Pitch diameter	$Z m$	
Addendum	m	
Dedendum	$1.25 m$	
Working depth	$2m$	
Tooth depth	$2.25 m$	
Outside diameter	$m (Z+2)$	
Tooth thickness	$1.5708 m$	
Clearance	$0.25 m$	
Radius of fillet	$0.4 m$ to $0.45 m$	

Where m =Module of the spur gear, Z = Number of teeth

SIMPLE INDEXING:

The simple indexing, sometimes called plain indexing, is more accurate and suitable for numbers beyond the range of rapid indexing. Here, the dividing head spindle is moved by turning the index crank. As the shaft carrying the crank has a single threaded worm which meshes with the worm gear having teeth, turns of the crank are necessary to rotate the index head spindle through one revolution. In other words, one complete turn of the index crank will cause the worm wheel to make of a revolution. To facilitate indexing to fractions of a turn, index plates are used to cover practically all numbers.

Index plates with circles of holes patented by the brown and Sharpe manufacturing company are as follows:

Plate No. 1 – 15,16,17,18,19,20

Plate No. 2 – 21,23,27,29,31,33

Plate No. 3 – 37,39,41,43,47,49

These plates have also been accepted as standard index plates by the Indian machine tool manufacturers.

With the three index plates supplied, simple indexing can be used for all divisions up to 50, even numbers up to 100, except 96.

The index plate used on Cincinnati and Parkinson dividing heads is of larger diameter than the Brown and Sharpe index plates. The different series of holes are provided on each side of the plate. The number of holes in each side of the plate are as follows:

First side – 24,25,28,30,34,37,38,39,41,42,43

Second side –46,47,49,51,53,54,57,58,59,62,66

RULE FOR SIMPLE INDEXING: To find the index crank movement, divide 40 by the number of divisions required on the work.

The formula for index crank movement is given below:

$$\text{Index crank movement} = \frac{40}{N}$$

Where N = number of divisions required.

If the index crank movement deduced from the formula is a whole number, the index crank should be rotated through a complete number of turns equal to the derived whole number. If the index crank movement deduced from the equation is a whole number and a fraction, the numerator and the denominator of the fraction after simplifying are multiplied by a suitable common number which will make the denominator of the fraction equal to the number of holes in the index plate circle. The new numerator now stands for the number of holes to be moved by the index crank in the hole circle derived from the denominator, in addition to the complete turns of the index crank.

Example : To mill 30 teeth on a spur gear blank.

$$\text{Index crank movement} = \frac{40}{30} = 1\frac{1}{3} = 1\frac{1}{3} \times \frac{7}{7} = 1\frac{7}{21}$$

Thus for indexing, one complete turn and 7 holes in 21 hole circle of the index plate will have to be moved by the index crank.

PRECAUTIONS:

- 1) Mounting of the Gear cutter on the arbor should be done carefully
- 2) Ensure clamping of the arbor of milling machine before machining

- 3) Indexing of the work piece should be done carefully
- 4) Cutting speed, feed, depth of cut should be selected precisely as per standards

VIVA QUESTIONS

1. Explain simple indexing method?
2. Explain compound indexing method?
3. Explain differential indexing method?
4. What are the gear finishing operations?
5. What do you mean by spur gear?
6. Describe a dividing head?
7. Name the cutter used for spur gear milling?
8. What is module of spur gear?
9. List out the different machines used for cutting gears?
10. List out the materials used for cutting gears?
11. How do you specify the milling machine?

6.DUMBELL

AIM: To make a dumbbell by double – box - moulding method.

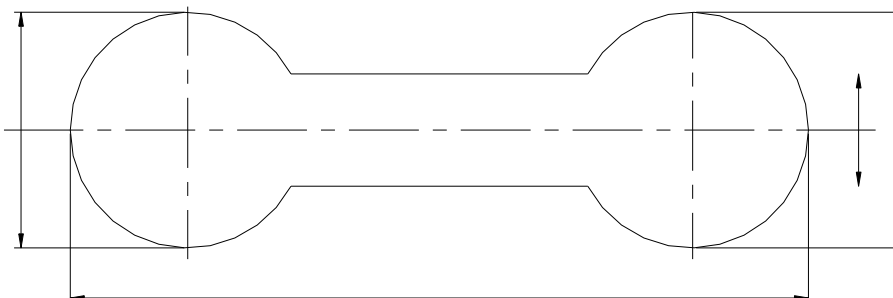
TOOLS REQUIRED:

- | | |
|-------------------|------------------|
| 1) Trowel | 2) Shovel |
| 3) Rammer | 4) Runner |
| 5) Vent rod | 6) Raiser |
| 7) Moulding boxes | 8) Strike of bar |
| 9) Draw spike | |

OPERATIONS :

- 1) Sand preparation
- 2) Ramming
- 3) Leveling
- 4) Toweling
- 5) Venting
- 6) Cleaning

FIGURE:



PROCEDURE :

1. The drag part of the pattern is placed on the bottom board and drag is placed on the pattern and fine sand is poured around the pattern.
2. Fill the drag with the backing sand by ramming it properly and excess sand is removed and drag is turned over and parting sand sprinkled over parting line.
3. Now place the cope over the drag and pour given sand in the box and ram it first.
4. Before pouring runner and raiser are placed properly in the cope.
5. After sufficient ramming excess sand is removed.
6. Sprinkle graphite powder over the pattern parts.
7. Now mould is ready for pouring the metal.

PRECAUTIONS :

1. Tempering of sand should be done carefully.
2. Ramming should be placed on suitable position.

RESULT : The dumbbell is made by double – box method.

VIVA QUESTIONS

1. What is the purpose of pattern?
2. Explain the moulding procedure?
3. What are the different types of sand?
4. What is the purpose of runner?
5. What are the different types of runners?
6. What is the purpose of riser?
7. What is cope and drag?
8. Why do you venting should be done?
9. Explain the parts of moulding boxes?

7.HANDLE

AIM: To make the handle mould by double – box sand moulding method.

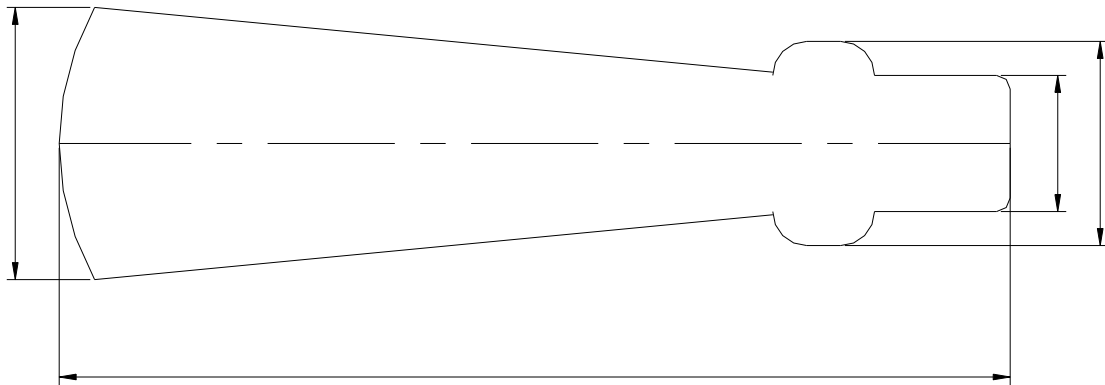
TOOLS REQUIRED:

- | | |
|-------------------|------------------|
| 2) Trowel | 2) Shovel |
| 3) Rammer | 4) Runner |
| 5) Vent rod | 6) Raiser |
| 7) Moulding boxes | 8) Strike of bar |
| 9) Draw spike | |

OPERATIONS :

- 1) Sand preparation
- 2) Ramming
- 3) Leveling
- 4) Troweling
- 5) Venting
- 6) Cleaning

FIGURE:



PROCEDURE :

1. Take the drag and pour moulding green sand over it and hammer it rapidly.
2. Extra sand is cut – off and pattern is invented at the middle end and sprinkle parting sand over it.
3. Now cope is put on the drag and pattern is kept on other half by coinciding with dowel pins.
4. Moulding sand is poured in to it and it is rammed. Runner and raiser are fixed.
5. After proper ramming runner and raiser are removed.
6. Sprinkle graphite powder over pattern parts.
7. Now mould is ready for pouring metal.

PRECAUTIONS:

1. Tempering of sand should be done carefully.
2. Ramming should be placed on suitable position.

RESULT : The required handle mould is thus obtained.

VIVA QUESTIONS

1. What are the properties of moulding sand?
2. What is the composition of moulding sand?
3. What are the different types of clays?
4. Why uniform ramming is required during moulding?
5. What are the different types of gates?
6. Explain gating system?
7. What do you mean by Backing sand, facing sand, core sand? What are its applications?
8. Why chills are used in moulds?

8.CONNECTING ROD

AIM: To make the connecting rod mould by double – box sand moulding method.

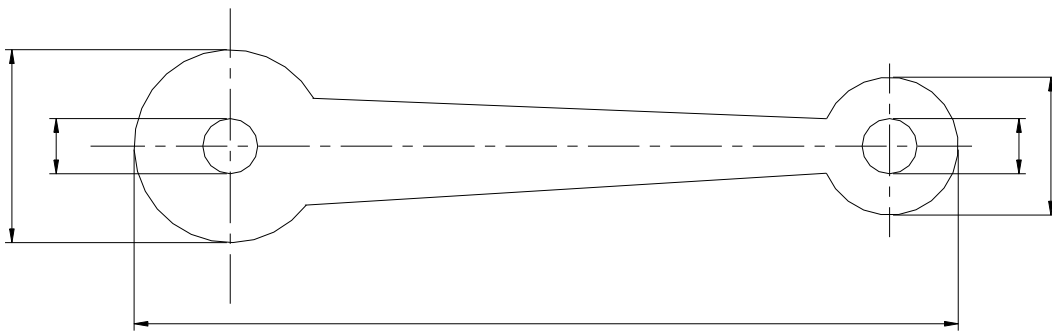
TOOLS REQUIRED:

- | | |
|-------------------|------------------|
| 1) Trowel | 2) Shovel |
| 3) Rammer | 4) Runner |
| 5) Vent rod | 6) Raiser |
| 7) Moulding boxes | 8) Strike of bar |
| 9) Draw spike | |

OPERATIONS :

- 1) Sand preparation
- 2) Ramming
- 3) Leveling
- 4) Toweling
- 5) Venting
- 6) Cleaning

FIGURE:



PROCEDURE :

1. The connecting rod, pattern is placed in the drag & facing sand is poured on it, slightly uniform ramming is done.
2. The drag is filled with the backing sand & ramming is done.
3. Excess sand is removed by strike of bar.
4. The drag is turned over and parting sand is sprinkled over the parting line.
5. Cope is placed over the drag. Runner & raiser are placed at suitable positions.
6. Facing sand is poured first and then the backing sand is removed by strike of bar. Runner and raiser are removed and excess sand removed by strike of bar.
7. Cope is removed over the drag.
8. Pattern is removed by draw spoke and gate cutting is done and vent holes are made.
9. Cope is placed over the drag. Mould is ready for pouring.

PRECAUTIONS :

1. Tempering of sand should be done carefully.
2. Ramming should be placed on suitable position.

RESULT : The required connecting rod mould is thus obtained.

VIVA QUESTIONS

1. What is the function of connecting rod?
2. What are the applications of connecting rod?
3. What are the casting defects?
4. What is mean by blow holes?
5. Where do you locate the runner and riser?
6. What is mean by permeability?
7. What is mean by refractoriness?
8. What is the purpose of core prints?
9. What are the pattern allowances?
10. List common pattern materials?
11. What is mean by shrinkage allowance?

9.LAP JOINT

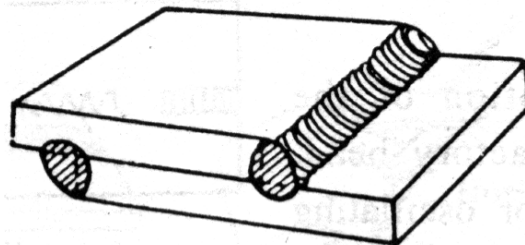
AIM: To make a lap welded joint.

TOOLS REQUIRED:

- 1) Electrode
- 2) Chipping hammer
- 3) Flanged tong
- 4) Safety goggles
- 5) Wire brush
- 6) Hand gloves

MATERIAL: A mild steel flat of 50 x 50 x 6mm thickness - two pieces.

FIGURE:



PROCEDURE :

1. The electrode is fixed in the electrode holder.
2. Two plates are placed in such a way that one overlaps the other and earthing is done to the two pieces.
3. The electrode, which is held in the electrode holder, is moved over plates, which is to be joined.
4. The flux formed on the welded joint is removed by chipping hammer.
5. Using the wire brush dust is removed.

PRECAUTIONS:

1. While welding the light should not be seen directly.
2. The job should be held with tongs after welding is completed.
3. The chipping of the job is done after immersing the welded job in water.

RESULT : Hence the lap – joint is obtained as shown in the figure.

VIVA QUESTIONS

1. Define Welding?
2. What do you mean by weld ment?
3. What are the diff. types of weld joints?
4. What is the use of edge preparation and in which type of weld joint it is used?
5. What is the difference between lap and butt joints?

10.SQUARE – BUTT JOINT

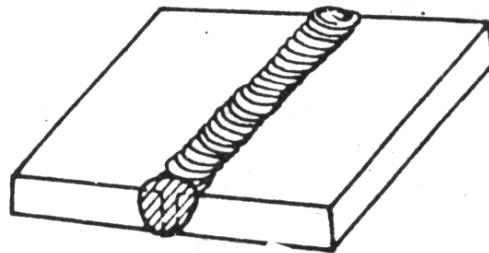
AIM: To make a square – butt welded joint.

TOOLS REQUIRED:

- 1) Electrode
- 2) Chipping hammer
- 3) Flanged tong
- 4) Safety goggles
- 5) Wire brush
- 6) Hand gloves

MATERIAL: A mild steel flat of 50 x 50 x 6mm thickness-two pieces.

FIGURE:



PROCEDURE :

1. First the electrode is fixed in the electrode holder.
2. The two given plates are attached by keeping them adjacent to each other and the electrode is held in the electrode holder and moved over the plates, which are to be joined.
3. Chipping the joint with the help of chipping hammer cleans the flux formed on the welding of the joint.
4. Using the wire brush the joint is cleaned and same procedure repeated on other side of plate.

PRECAUTIONS:

1. While welding the light should not be seen directly.
2. The job should be held with tongs after welding is completed.
3. The chipping of the job is done after immersing the welded job in water.

RESULT : The required square – butt joint is obtained as shown in the figure.

VIVA QUESTIONS

1. What is the range of thickness of plate for single V, double V, single U, double U butt joints, lap joints, corner joints, Tee joints and edge joints?
2. Which welding position is more beneficial? Give reasons?
3. What are the major defects which occur in welding?
4. What is the necessity in cleaning the joint?
5. Name the filler material which is used in preparing the joint?

11.T – JOINT

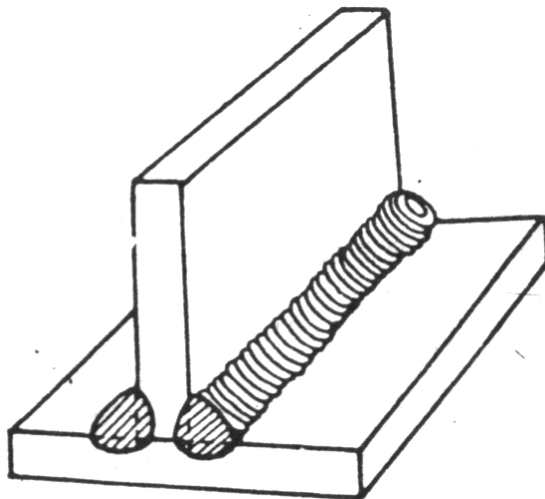
AIM: To make a T – welded joint.

TOOLS REQUIRED:

- 1) Electrode
- 2) Chipping hammer
- 3) Flanged tong
- 4) Safety goggles
- 5) Wire brush
- 6) Hand gloves

MATERIAL: A mild steel flat of 50x 50 x 6mm thickness-two pieces.

FIGURE:



PROCEDURE :

1. First the electrode is fixed in the electrode holder.
2. The given pieces are arranged in such a way that one is perpendicular to other.
3. The electrode is moved over the plates to be joined.
4. The flux formed is removed by using chipping hammer.
5. Using the wire brush the joint is cleaned and the same procedure is repeated on the other side of the joint.

PRECAUTIONS:

1. While welding the light should not be seen directly.
2. The job should be held with tongs after welding is completed.
3. The chipping of the job is done after immersing the welded job in water.

RESULT : The required T – welded joint is obtained as shown in the figure.

VIVA QUESTIONS

1. What is the criteria to select an electrode?
2. What are the different zones of a typical weld?
3. What are the different methods to find the weld defects?
4. What do you mean by weld spatter?
5. What do you mean by inclusion defect?

12.CORNER JOINT

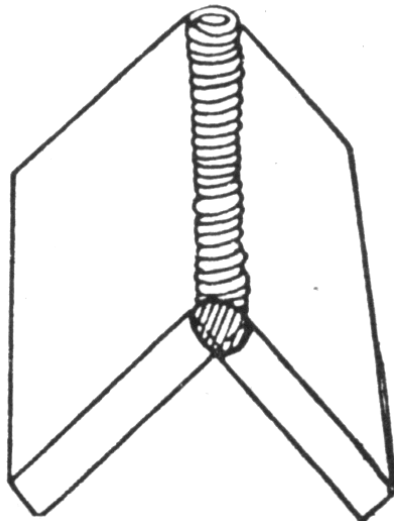
AIM: To make a Corner welded joint.

TOOLS REQUIRED:

- 1) Electrode
- 2) Chipping hammer
- 3) Flanged tong
- 4) Safety goggles
- 5) Wire brush
- 6) Hand gloves

MATERIAL: A mild steel flat of 50 x 50 x 6mm thickness-two pieces.

FIGURE:



PROCEDURE :

1. First the electrode is fixed in the electrode holder.
2. Electrode is moved carefully by maintaining a gap of 3mm while welding.
3. The given two pieces are placed in such a way that one should rest on the edge of the other and represent at right angles to each other and the electrode is held in the electrode holder and moved over the plates which are to be joined.
4. The flux formed on the welding of the joint is removed by chipping the joint with the help of chipping hammer.
5. Using the wire brush the joint is cleaned and the procedure is repeated on the other side of the plate.

PRECAUTIONS:

1. While welding the light should not be seen directly.
2. The job should be held with tongs after welding is completed.
3. The chipping of the job is done after immersing the welded job in water.

RESULT : Hence the corner welded joint is obtained as shown in the figure.

VIVA QUESTIONS

1. What do you mean by weld bead?
2. What are different types of butt joints?
3. What are different types of lap joints?
4. What is the difference between leftward welding and right ward welding?
5. What is the general range of angles for leftward and right ward welding?
6. What do you mean by weld penetration?
7. Where do weld penetration defect occurs?

13.CONVERSION OF ROUND TO SQUARE

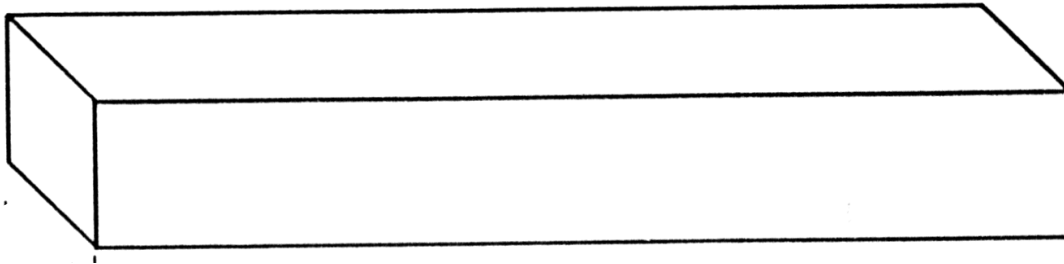
AIM: To be able to convert the round section to square section of a given mild steel round by forging.

MATERIAL REQUIRED: ϕ 12 X 75 mm Mild Steel round.

TOOLS AND EQUIPMENT:

- 1) Forge
- 2) Anvil
- 3) Sledge hammer
- 4) Hand hammer
- 5) Flat tong
- 6) Round tong
- 7) Flatter
- 8) Brass rule

FIGURE:



SEQUENCE OF OPERATIONS:

- 1) Checking the raw material.
- 2) Lighting the forge.
- 3) Heating the raw material in the forge.
- 4) Drawing the material through hammering by supporting the work piece on anvil.
- 5) Squaring the material through flatter.
- 6) Checking the dimensions by brass rule.

PRECAUTIONS:

- 1) The work piece is observed for proper heating.
- 2) Proper tongs and hammers are used.
- 3) Hammering of the raw material is done in red heat condition only.
- 4) Use gloves and gum boots.
- 5) Beware of your clothes. Do not expose them to heat.
- 6) Watch properly while hammering.

VIVA QUESTIONS

1. Define forging process?
2. Describe the common types of forging hammers?
3. What is upset forging?
4. What are the tools required to perform forging operations?
5. What is rotary forging or swaging?
6. Define forgeability on what factors does it depends?

14.RING AND HOOK

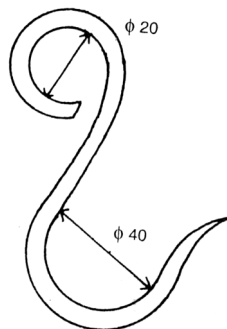
AIM : To be able to make Ring And Hook from round bar by forging.

MATERIAL REQUIRED: ϕ 10 X 250 mm Mild Steel round

TOOLS AND EQUIPMENT:

1. Forge
2. Swage block
3. Anvil
4. Sledge hammer
5. Hand hammer
6. Flat tong
7. Round tong
8. Steel rule

FIGURE:



SEQUENCE OF OPERATIONS:

1. Checking the raw material.
2. Lighting the forge
3. Heating the raw material in the forge.
4. Bending the heated material into ring shape.
5. Bending the remaining length into hook shape.
6. Checking the dimensions by steel rule.

PRECAUTIONS:

1. The work piece is observed for proper heating.
2. Proper tongs and hammers are used.
3. Hammering of the raw material is done in red heat condition only.
4. Use gloves and gum boots.
5. Beware of your clothes. Do not expose them to heat.
6. Watch properly while hammering.

VIVA QUESTIONS

1. Describe the applications of Hook?
2. What is the purpose of heat treatment of forgings?
3. What are the common defects in forgings and explain the causes of each?
4. What are the various methods for cleaning the forgings?
5. What are the advantages and draw backs of forging process?
6. How are a forging hammer and drop hammer alike and how do they differ?