

TURNING

It is the process of removing undesired raw material from the piece of work and give it a cylindrical shape and size. It is done by fitting a cutting tool against a rotating work piece.

The machine tool by which carry out the turning operation is called Lathe.

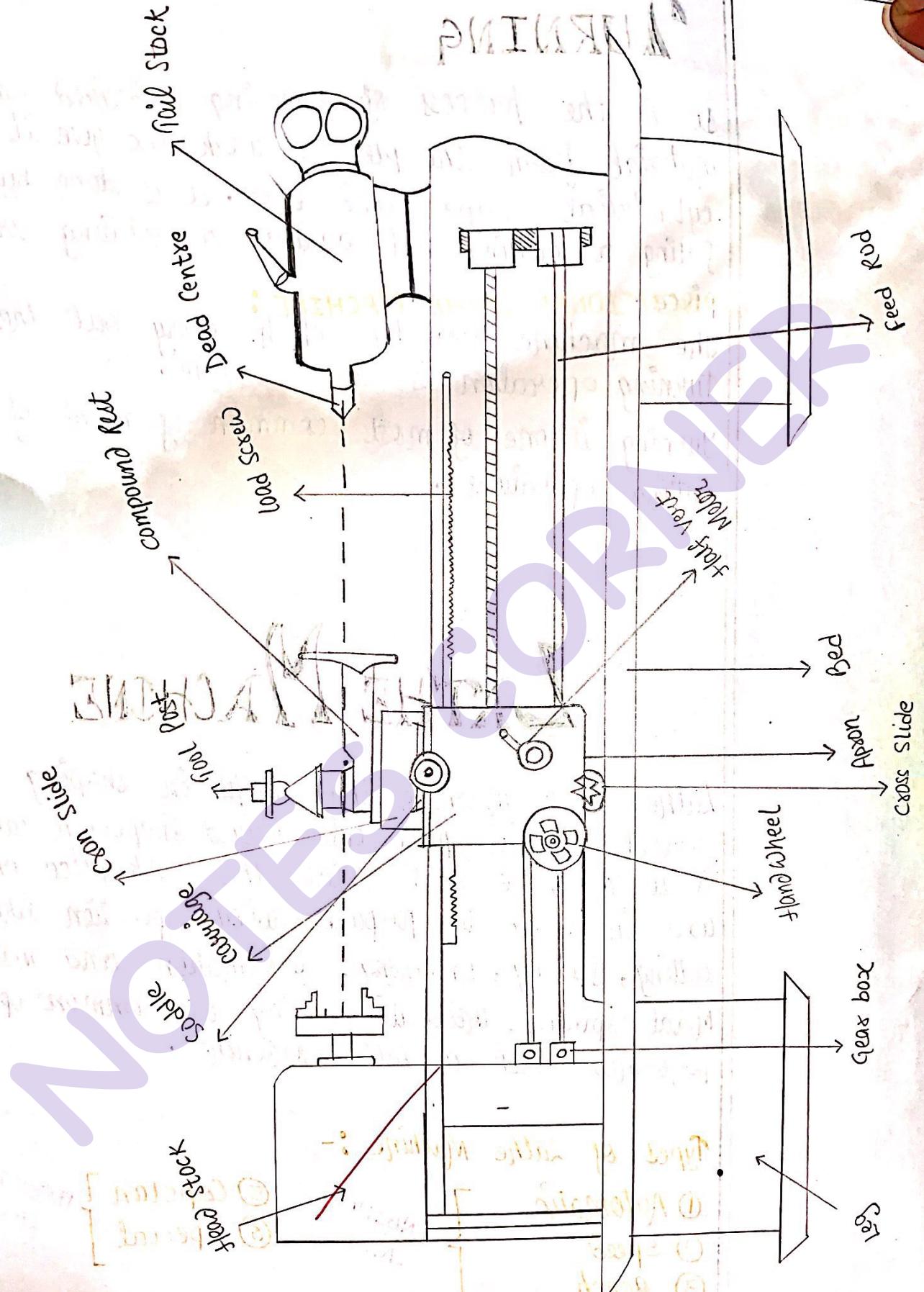
Turning is one of most common of metal of cutting operations.

LATHE MACHINE

Lathe is a machine that helps in shaping several material pieces into desired shapes. A lathe is a machine that rotates the work-piece on the axis in order to perform various operation like cutting, facing, knurling, deformation and more. Metal spinning, thermal spraying are common operation performed with a lathe machine.

Types of Lathe Machine :-

- ① Automatic
 - ② Speed
 - ③ Bench
 - ④ Tool Room
- ENGINE LATHE
- ⑤ Capstan
 - ⑥ Special
- PRODUCTION LATHE



DIFFERENT TYPES OF LATHE

MACHINE

CONVENTIONAL LATHE MACHINE: Under this machine we have several machine :-

- [1] Engine Lathe : It is most important machine tool in Lathe family and by far most widely used. Early machine tools were driven by separate engine with overhead belts and shafts. The cutting tools are controlled either by hand or power.
- [2] Speed Lathe : It is the simplest form of lathe machine and consists of a simple headstock, tailstock, footrest. It has no gear box, lead screw and carriage. This machine is intended for wood turning, metal spinning and polishing operation.
- [3] Capstan Lathe : More than one operation can be carried out simultaneously by this machine. In it several tools are set on revolving capstan to facilitate doing of large no of operation on a job.
- [4] Tool room Lathe : It is the modern engineering lathe equipped with all necessary arrangement for tool room work. It is a general head driven machine with considering range in spindle speeds.
- [5] Bench Lathe : It is the smallest lathe which is usually mounted on a work bench meant for small and light job.

[6] Computer controlled Lathe : A highly automated lathe where both cutting, loading, tool changing & part unloading are automatically control by computer control.

DIFFERENT PARTS OF LATHE

MACHINE

[1] Head stock :- It is normally mounted rigidly to the bed and holds all the mechanisms, including various kind and combination of pulley or gears so that the spindle can be made to turn at different speed.

[2] Tail stock :- The unit is arranged to slide along the bed and can be locked to it any convenient point, the upper position of the unit is fitted with what is variously called barrel, spindle, ram that can be moved in and out of the main casting by hand lever feed and carries as "Dead centre" that support other end of work held in head stock.

[3] Bed :- The bed of the lathe provides the foundation for whole machine and hold the headstock, tailstock and carriage in alignment. The surfaces of bed that are finely machined upon which the carriage and tailstock slide are known as 'ways'.

[4] Spindle :- The spindle is made from high tensile steel and is well machined and ground. It is hollow type and has screwed nose to receive the chuck.

[5] Carriage :- The whole assembly of Saddle, Apron, Top and cross slide is known as "Carriage".

• Saddle : The casting that fits onto the top of the bed and slides along it is known as most universally as the saddle a self explanation and very suitable term.

• Apron : Attached to the front of the carriage it has mechanism and controls for moving carriage and cross slide.

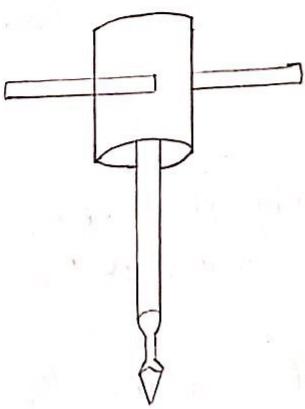
[6] Tool post :- It rigidly clamp the cutting tool at the proper height relative to work centre.

[7] Cross Slide :- It provide automatic cross movement for cutting tool.

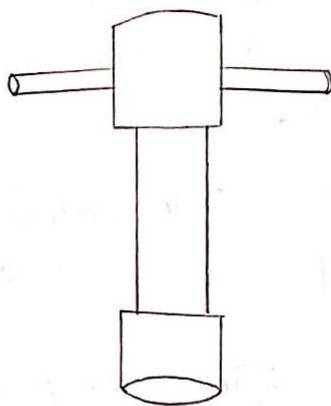
[8] Compound slide :- It offer way to turn taper and cut angle on lathe without rotating head-stock.

[9] Feed Rod :- It is a power transmission mechanism used for linear movement of carriage along longitudinal axis of lathe.

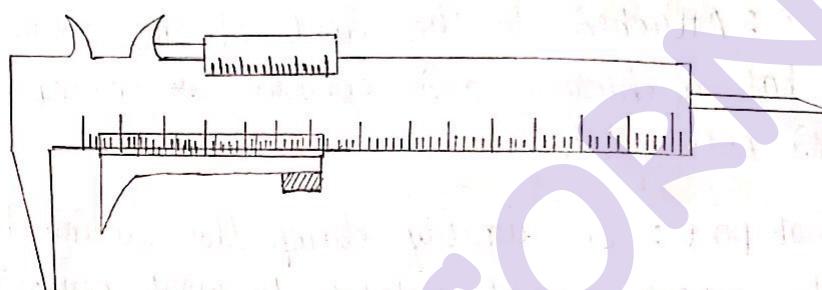
[10] Lead Rod :- Basic function of lead screw is to move turret by precise increment for every rotation of screw. It is carried for thread cutting.



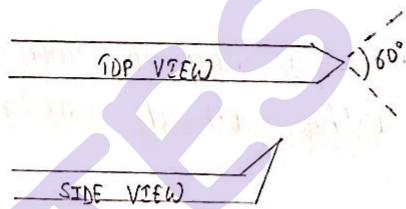
• CHUCK KEY



• TOOL POST KEY



• VERNIER CALIPER



• V-SHAPED CUT TOOL



• KNURELLING TOOL

[11] Chuck :- 3 Jaw [self centering] on 4 Jaw [independent] to clamp part being machines. Allows the mounting of difficult working that are not round, square and triangular.

[12] Gear Box :- It is giving control over torque, speed, and their use in lathe machine is no exception.

TOOLS AND EQUIPMENT

[I] Chuck Key : It is a specialised type of clamp used to hold an object with radial symmetry especially a cylinder.

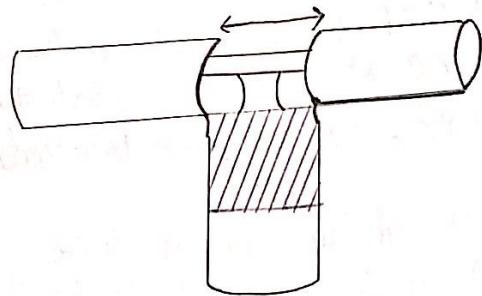
[II] Tool Post Key : It is a key kept in holder of machine so that changes can be done easily.

[III] Vernier Calliper : It is a visual that allow user to measure dimension of object accurate.

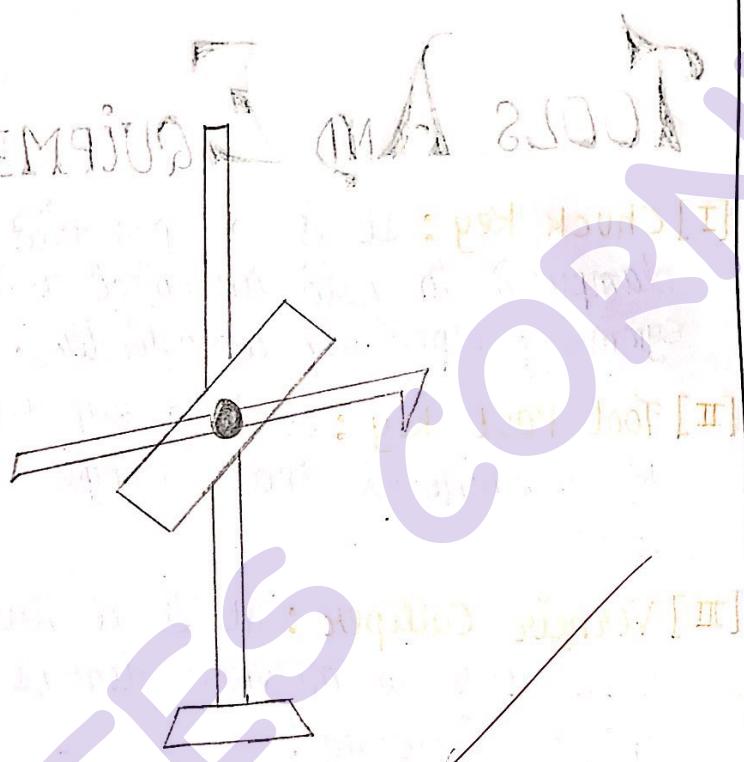
[IV] V-shape single point cut tool :- These tools are used in turning shaping etc by means of one cutting edge to remove waste material.

[V] Knurling Tool :- It is normally uses on knobs where better grip are needed.

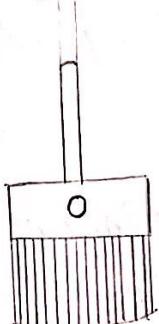
[VI] Packing :- Material for various thickness used to adjust the component of machine before being operated.



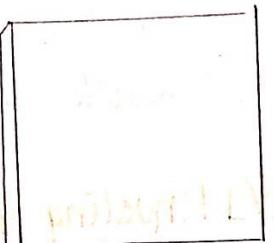
• GROOVING TOOL



• SURFACE GAUGE



• WOODEN BRUSH

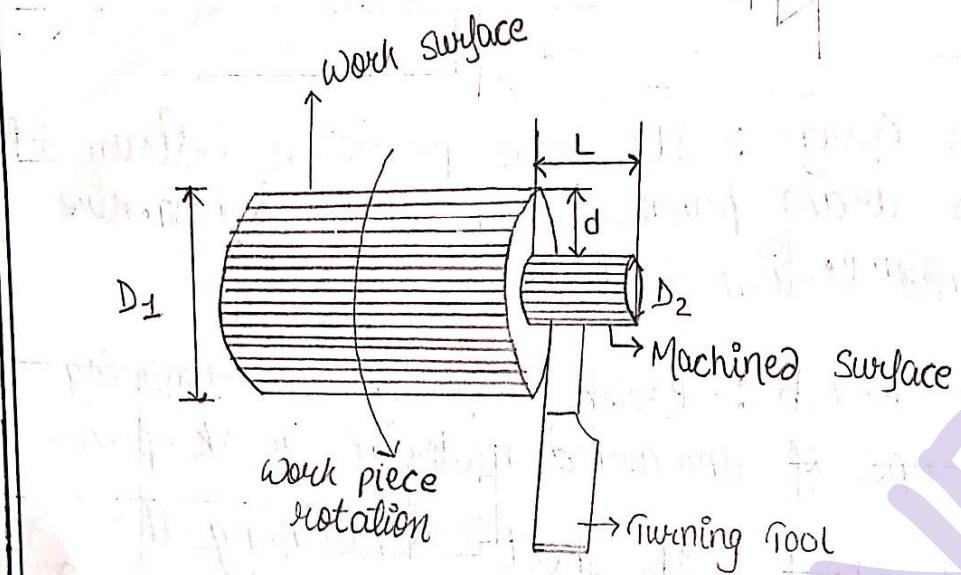


• DRAWING SHEET

- [7] Grooving Tool :- It is a tool to form a narrow cavity on certain depth of cylindrical work piece.
- [8] Surface Gauge :- It's non-precision instrument used to draw parallel line and find centre of round section material.
- [9] Wooden Brush :- Brush requires for removing the scraps of unwanted material work-piece.
- [10] Drawing Sheet :- It sheet containing the pre-designed model of work-piece to be made.

LATHE OPERATION

- [1] Turning :- Procedure of produce straight, conical or grooved work pieces.
- [2] Facing :- To produce a flat surface at the end of the part or for making face grooves.
- [3] Boring :- To enlarge a hole or cylinder cavity made by a previous process or to produce circular internal grooves.
- [4] Drilling :- To produce a hole by fixing a drill in tailstock.
- [5] Threading :- To produce external threads.
- [6] Knurling :- To produce regular shape roughness on cylindrical surface.



- Drilling, Boring, & Reaming

NOTES

SPECIFICATION OF LATHE

MACHINE

A Lathe is generally specified by :-

- [1] It's swing, the maximum diameter of work-piece that can be machined.
- [2] The maximum distance between the headstock and tailstock centre i.e. the distance between live centre to dead centre.
- [3] The length of the bed.
- [4] Total length of the machine.

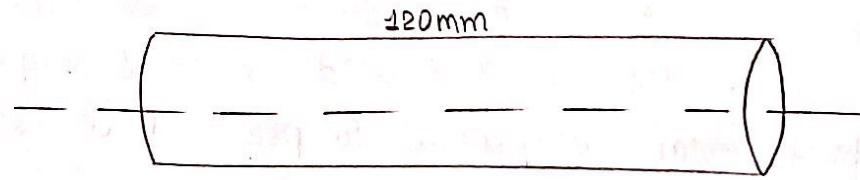
ACCESSORIES

[1] Live Centre : Live centre fit on headstock spindle made of hardened steel. The workpiece is cut to a 60° included angle. It is called Live centre because it turns with headstock spindle.

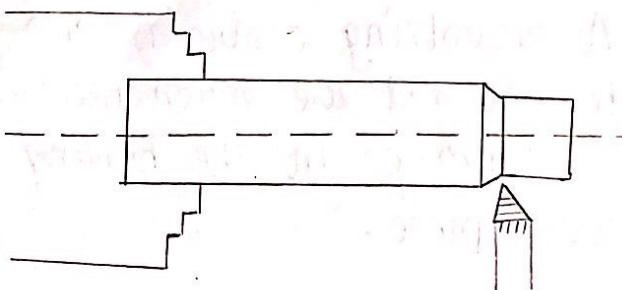
[2] Dead Centre : There are two types said dead centre and revolving dead centre. It's called so because unlike live centre it doesn't turn. It been lubricated so that to prevent damage caused by friction & heat

[3] Drill Chuck :- It a specialised self centering three jaw chuck usually with a capacity of 13mm or less used to hold drill bits or other rotary tools. It's generally used on tools ranging from professional equipment to power drill for domestic use.

[4] Revolving centre :- A revolving centre is also known as live centre. It not use much because its not accurate as clearance in the bearing is transmitted to work piece.



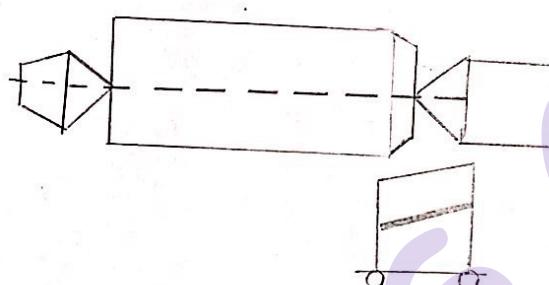
• Mild Steel Sheet



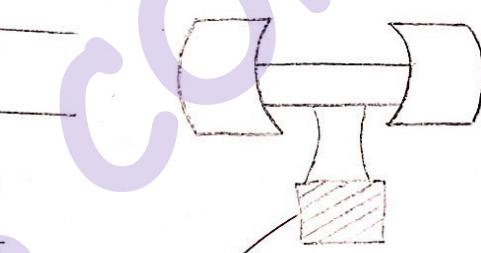
• Plane Turning



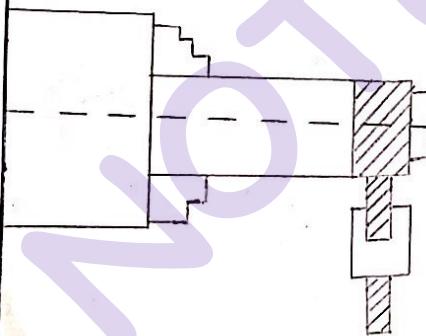
• Chamfering



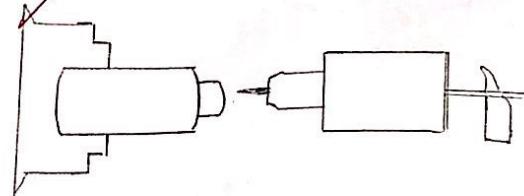
• Taper Turning



• Grooving



• KNURLING



• DRILLING

Aim Of THE EXPERIMENT :

To prepare a job with multiple turning operation such as,

- [a] facing
- [b] Plane Turning
- [c] Step Turning
- [d] Taper Turning
- [e] Grooving
- [f] Knurling
- [g] Chamfering

RAW MATERIAL REQUIRED :

Mild Steel bar

SIZE OF JOB :

Length = 80mm

Diameter = 25mm

TOOLS REQUIRED :

- [a] Chucking
- [b] 'V' Shape cutting tool
- [c] Packing
- [d] Tool Pose Key
- [e] Grooving tool
- [f] Knurling tool
- [g] Veneier callipers
- [h] 17/13 DE spanner
- [i] 14/15 DE spanner
- [j] Brush

PROCEDURE :

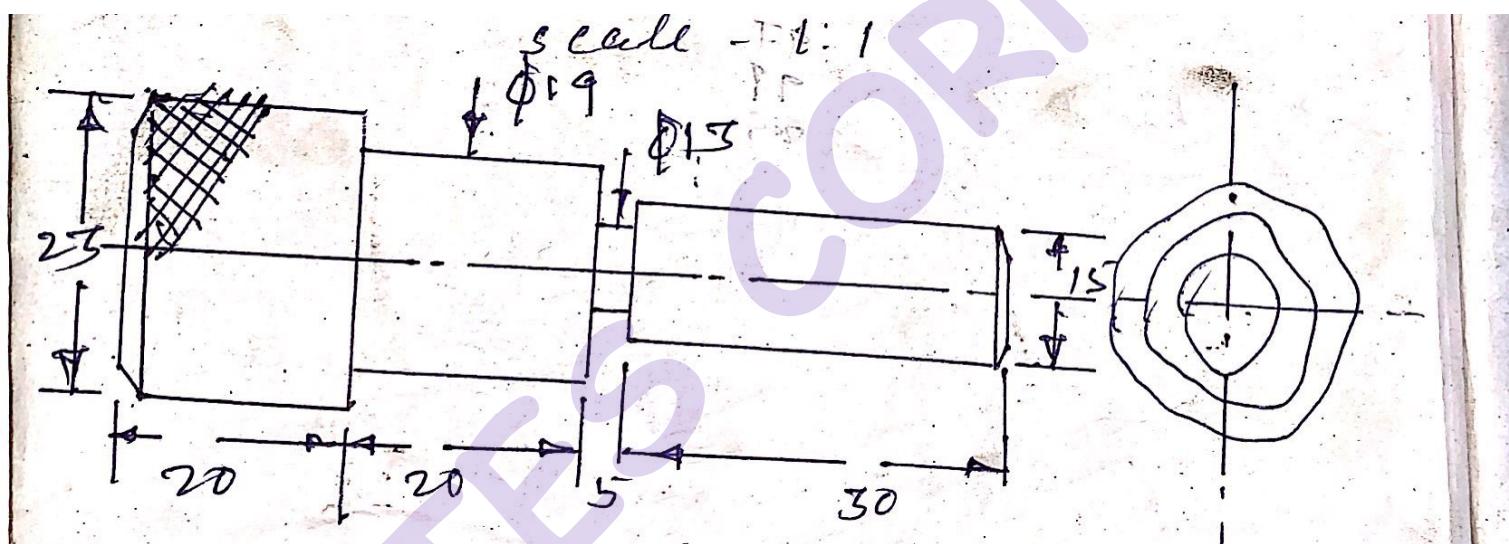
- [E] The work piece is taken and fitted inside the spindle and is held using the chuck.

- [2] centre alignment is ensured by pulling the job in their and then the chuck is tight & using chuck key.
- [3] The 'V' shaped cutting tool is adjusted in the tool post and tightened using tool post key.
- [4] cutting tool is now adjusted with the axis of rotation of workpiece and the facing action is done by moving the cutting tool along y-axis.
- [5] same process is carried out using the cutting tool for the facing of other side.
- [6] The cutting tool is adjusted again for turning action. The cutting tool is touched with the work-piece and is moved along the x-axis until the whole job is reduced to the desired depth. Repeat it for the both side.
- ~~[7]~~ Next for tapers turning operation we have to figure out the angle of cut θ from the formulae

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

D = Primary diameter
d = final diameter
l = length of the job

- then taper turning, operation is done using compound rest method that gives desired shape.
- ~~[8]~~ The knurling operation is ~~desired~~ part of the job by using knurling tool in tool post and moving it slightly along x-axis.
- ~~[9]~~ Then chamfering operation is done on the moving part both sides of the job using the V-shaped cutting tool is 45° angle.
- ~~[10]~~ Grooving is done using grooving tool and completes the job.



CONCLUSION :

- Cutting Speed :- Peripheral speed of work piece over cutting tool.
- In plane turning operation

$$= \frac{\pi D N}{1000} \text{ rpm} \quad D = 20$$

$$CS [v] = \frac{3.14 \times 20 \times 50}{1000}$$

$$= 24.395$$

- Feed :- Distance of tool in one revolution of job

In plane turning operation

$$f = \frac{l}{N T}$$

$$f = \frac{80}{310 \times 2} \text{ mm/rev}$$

$$f = 0.040 \text{ mm/rev}$$

- Depth cut :- The lar distance b/w initial diameter and after machining diameter.

In plane turning operation

~~$$= 1000 \times v \times d \times f = \frac{1000 \times 24.935 \times 0.5 \times 0.048}{60}$$~~

~~$$= 97.34 \text{ mm}^3/\text{sec}$$~~

SAFETY PRECAUTION :-

- ★ Stay away from moving part of machine.
- ★ Maintain a perfect distance between the edges and job getting work on prevent metal scrap.
- ★ Tool should be kept on tray.

*AF
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LATHE

MACHINE

NO CORNER