① How a lathe Machine specified ? Describe the principal components of a centre lathe.

Ans A lathe machine is specified through the following factors

(i) height of centres measured from lathe bed.

(ii) Swing diameter over bed. This is the largest diameter of work that will revolve without touching the bed & is twice the height of centre measured from bed of lathe.

(iii) Length between centres. This is the largest diameter of work that will revolve over the lathe saddle., & is always less than swing diameter over bed.

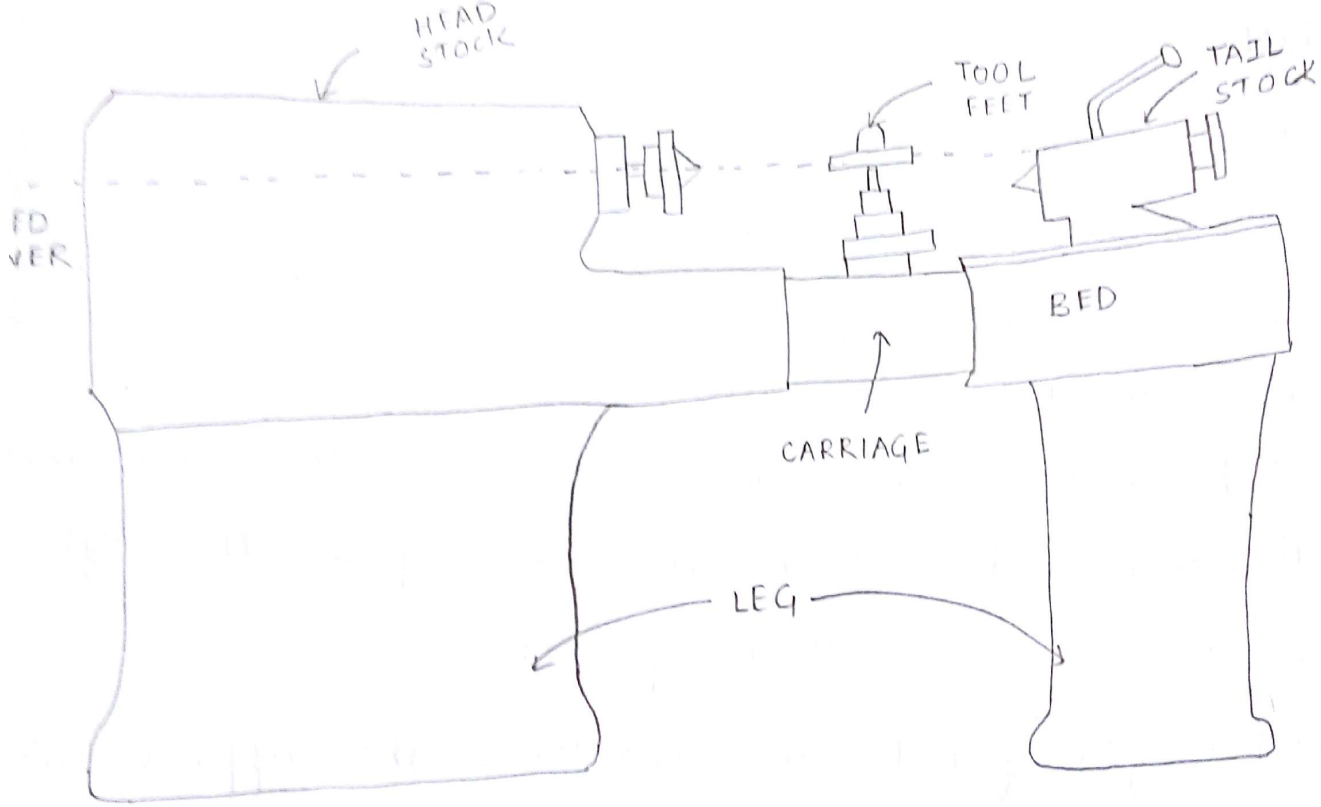
(iv) Swing diameter over carriage:- This is the maximum length of work that can be mounted between the lathe centres.

(v) Maximum bed diameter :- This is the maximum diameter of bar stock that will pass through hole of the headstock spindle.

(vi) Length of bed : This indicates the approximate floor space occupied by the lathe.

Centre Lathe or Engine Lathe

The term 'engine is associated with the lathe due to fact that in early days of its development, it was run by steam engine. It is mostly widely used lathe like speed lathe, the centre lathe has all basic parts. eg bed, headstock, tailstock. It is much more robust in construction & contains additional mechanism for driving the lathe spindle at multiple speeds It can feed the cutting tool both in cross & longitudinal direction with references to lathe axis



PRINCIPAL COMPONENTS OF CENTRAL LATHE

· BED :- Bed of a lathe machine is the base on which all other parts are mounted. It is massive & rigid single piece casting made to support other active parts of lathe. Generally made of cast iron alloyed with nickel

HEAD STOCK:- The main function of head stock is to transmit power to different parts of lathe. Main spindle is adjusted in it.

TAIL STOCK:- It is commonly used for objective of primarily giving an outer bearing & support the circular job being turned on centres.

CARRIAGE:- It is mounted on outer guide ways of lathe bed. & it can move in a direction parallel to the spindle axis. It comprises of important parts such as apron, cross slide, saddle

FEED MECHANISM:- It is the combination of different units through which motion of headstock spindle is transmitted to carriage of lathe machine

2. Discribe the following operations.- Turning, facing, grooving & chromfering.

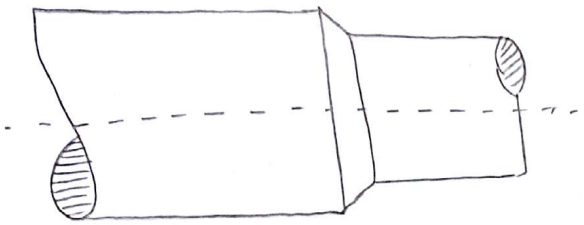
Ans:- Turning in a lathe is to remove excess material from workpiece to produce a cylindrical surface of required shape & size

Facing:- It is the operation of machining the ends of a piece of work to produce flat surface square with the axis.

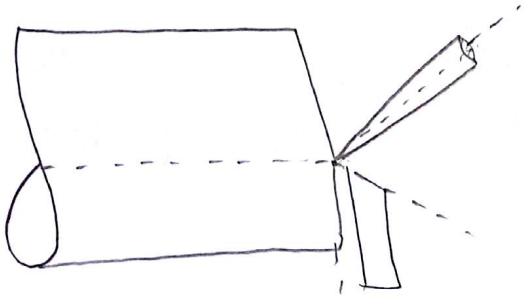
Grooving:- It is the process of cutting a narrow groove on cylindrical surface of workpiece.

Chamfering:- It is the operation of bruelling the extreme end of workpiece

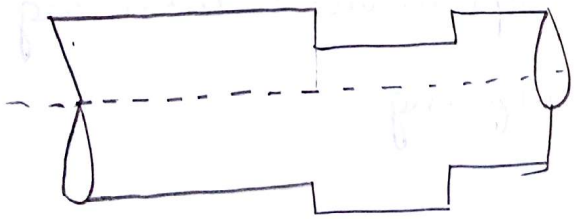
3 - Draw the schematic diagram of turning, facing & grooving operation:-



Turning operation
(straight turning)



Facing operation



Grooving operation
(cut-off)

3. Explain cutting speed, feed & Depth of cut in a relation to turning operation in the

Ans. Cutting speed: It is defined as rate in metres per minute at which the surface of the job, moves past the cutting tool. Machining at a correct cutting speed is highly important for good tool life & efficient cutting. Too slow cutting reduces productivity & increases labour cost. Too high can lead in overheating of tools & failure of cutting edge

Cs (Cutting speed) = $\left(\left(\frac{22}{7} \times D \times N\right)/1000\right)$ where D → Diameter of job in mm.

N → RPM

Feed: It is defined as the distance between tool advancement into work during revolution of head stock spindle. It is usually given as linear movement per revolution of job. Feed is rate at which tool is moved into the part. It is measured in mm per time period.

Formula to drive feed rate:-

FR = RPM × T × CL.

FR: Calculated feed rate

RPM: Calculated speed of cutter

T = Number of teeth on cutter

CL: Size of chip that each teeth of cutter takes

Depth of cut

It is the distance that tool bit moves into the work. Usually measured in thousandth of inch or in mm. General machine practice is used depth of cut upto 5 times the rate of feed

$$\text{Depth of cut} = \frac{d_1 - d_2}{2}$$

d_1 = diameter of work surface before machining

d_2 = diameter of surface after machining.

MILLING

1. How a milling machine is specified

Ans A milling machine is specified as follows.

1) Table size of the machine
2) No of speed variations
3) Maxm table travel length - Longitudnal, Vertical, cross trave
4) Power of motor
5) Max. weight of workpiece
6) Net weight of machine
7) Overall spindle diameter

2) What is the difference between up & Down Milling

UP Milling	Down Milling
Workpiece feed in apposite	Workpiece feed in same
chips are progressively thicker.	Chips are thinner
Strong clamping is required since cutting force is directed upwards & tends to lift the work piece.	Not required since the cutting force is directed downwards & work piece is kept pressed to table.
Gives poor surface finish	Gives good finish
Used for hard materials	Used for soft Materials

the operations done in a milling
machine.

(i) Plain / surface :- Process of getting flat surface on work piece in which the cutter axis & work piece are parallel

(ii) Form Milling :- operation carried out for producing a flat surface, which is perpendicular to axis of rotating cutter.

(iii) End Milling :- operations performed for producing flat surfaces, slots for finishing the edges of workpiece.

(iv) Slot Milling :- operation of producing slots like T-slots, plain slots, dovetail slots. End milling cutter, T-slot cutter, dovetail cutter or side milling cutter.

(v) Angular Milling :- Operation of producing all types of angular cuts like V notches, grooves & angular surfaces.

SHAPING MACHINE:-

Draw & explain a quick return mechanism in a shaping machine.

The ram moves at a comparatively slower speed during the forward cutting stroke. During the return stroke the mechanism so designed to make the tool move at a faster rate to reduce the idle return time. The mechanism is known as the quick return mechanism. As the ram moves at a faster rate during return stroke, the time taken becomes less. Total machining time decreases & rate of production increases. This can be done by i) crank & slotted link Mechanism (ii) Quick Return Mechanism.

In diagram 'KA' indicates starting point of forward cutting stroke & KB, the end of cutting stroke. The rotation of crank 'OP' in clockwise direction through the angle $P_1 R P_2$ refers to the forward cutting stroke. Rotation of crank in same direction through angle $P_2 L P_1$ refers to the return stroke as the angle $P_2 L P_1$ is smaller than $P_2 R P_1$ time taken for return stroke is less than that of forward stroke. So it is evident that speed at which the ram travels during return stroke is

more

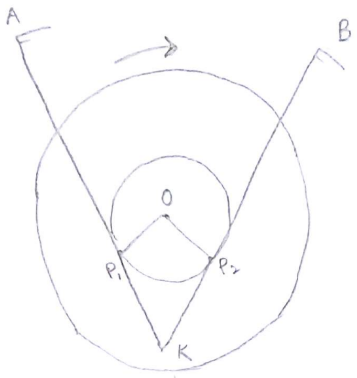


Fig - 1 QUICK RETURN MECHANISM

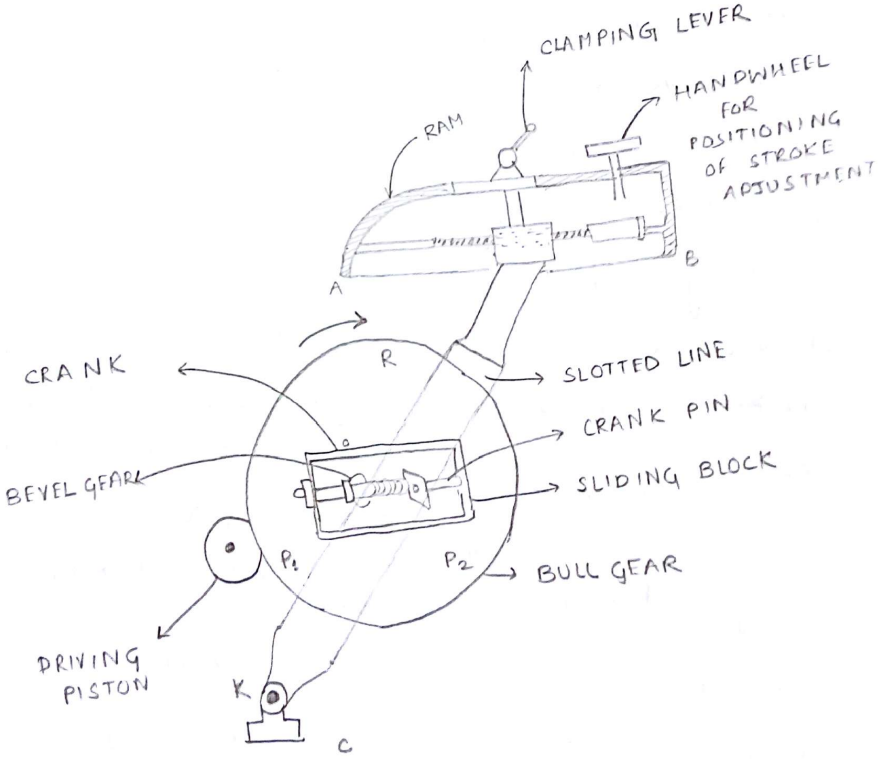


Fig - 2 CRANK & SLOTTED LINK MECHANISM

(2) Explain the function of clapper Box?

The two vertical walls on apron called clapper box houses the clapper block which is connected to it by means of hinge pin. The tool post is mounted upon the clapper block. On the forward cutting stroke, the clapper block fits securely to the clapper box to make a rigid tool support on the return stroke a slight frictional drag of tool on the work lifts the block out of clapper box, a sufficient amount preventing the tool cutting edge from dragging & consequent wearing. The work surface is also prevented from damage.

How the stroke length & position of stroke is adjusted.?

As before shaping a part, it is required to set up the job with cutting tool on shaper accurately for the process. Two adjustments have to be proposed on ram proceeding to work piece. Initially the stroke length, has to be adjusted It is ready by turning stroke adjusting shaft. or stroke selector. Mayority of shapers contain scale on ram. by a pointer to point out stroke length. Stroke length is adjusted while the ram, is in its excessive return place.

Describe feed mechanism in a shaper.

On a shaper both downfeed & crossfeed movements may be obtained. Unlike a lathe, these movements are provided intermittently and during the end of return stroke only. Vertical or bevel surfaces are produced by rotating the downfeed screw of toolhead by hand. Crossfeed movement is used to machine a flat horizontal surface. This is done by rotating the cross feed screw either by hand or power. Rotation of crossfeed causes the table mounted upon the raddle to move sideways. Through a predetermined amount at end of each return stroke, so as to bring the uncut surface of the work in direct path of reciprocating tool.