

# Machine Tools and Operations

## Internal Assessment Solution: 01

(A) Define Machine tool. List the different types of Machine tools.

A machine tool is a power driven machine used for metal cutting. A given workpiece is shaped by removal of material using a machine. The place where machining or material removal takes place is referred to as a machine shop and the machine referred to as machine tool.

A machine tool is classified as given below based on a particular parameter.

(i) Based on the purpose.

\* Single purpose machine tool

\* Multi purpose machine tool

\* Special purpose machine tool

\* Tape controlled or Numerically controlled machine tool.

(ii) Based on the chip size.

\* Smaller chips

\* Bigger chips

(iii) Based on the type of surface produced.

\* plane surface

\* surface of revolution

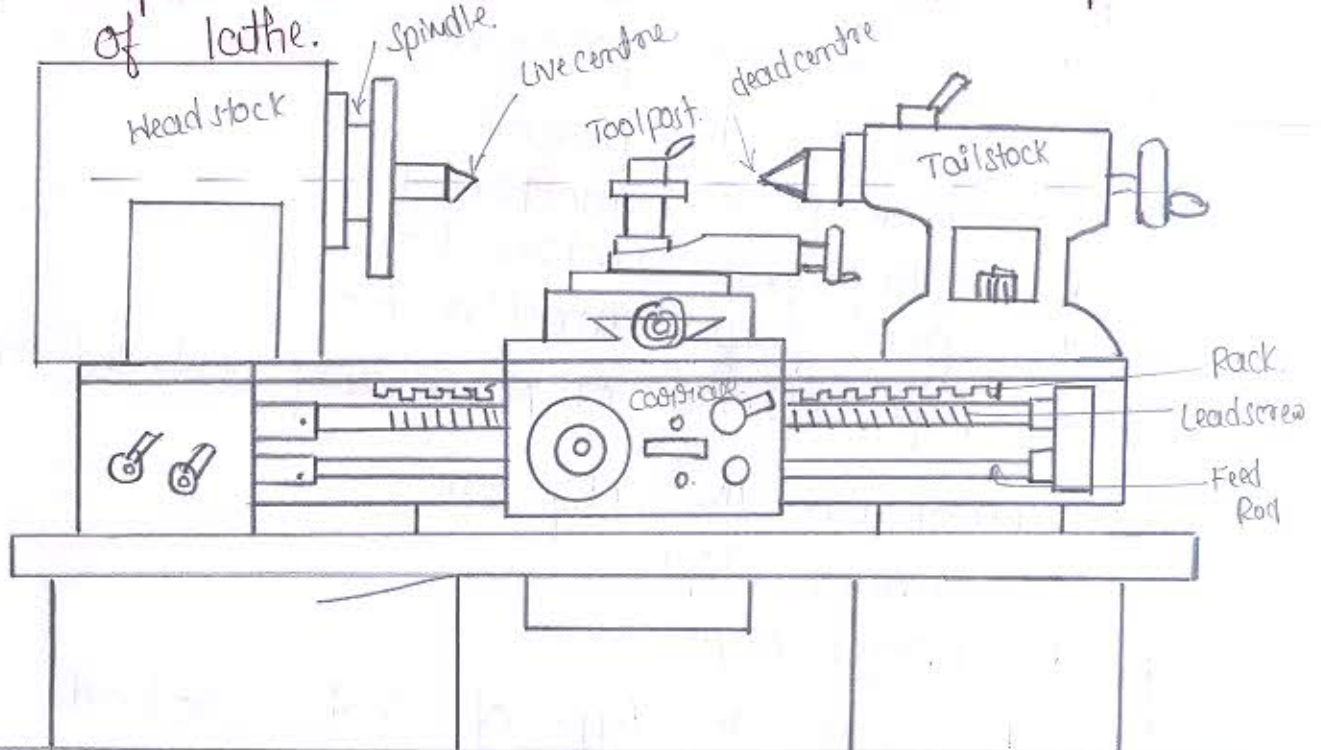
\* Teeth cutting

(B) Describe the classifications of Drilling Machine. Drilling machine are made in different sizes and types. Each is capable of handling specific jobs.

Following list gives the classifications.

- (i) portable drilling Machine
- (ii) Bench drilling Machine
- (iii) Radial drilling Machine
  - \* plain \* universal \* semi universal.
- (iv) up Right drilling Machine
  - \* Box column \* Round column.
- (v) Multiple spindle drilling Machine
- (vi) Gang drilling Machine
- (vii) Automatic drilling Machine
- (viii) Deep hole drilling machine
- (ix) CNC drilling Machine.

(2) Explain with a neat sketch different parts of lathe.



parts of lathe Machine

Bed: It is the main body of the machine. All main components are bolted on it. It is usually made by cast iron due to its high compressive strength and high lubrication quantity.

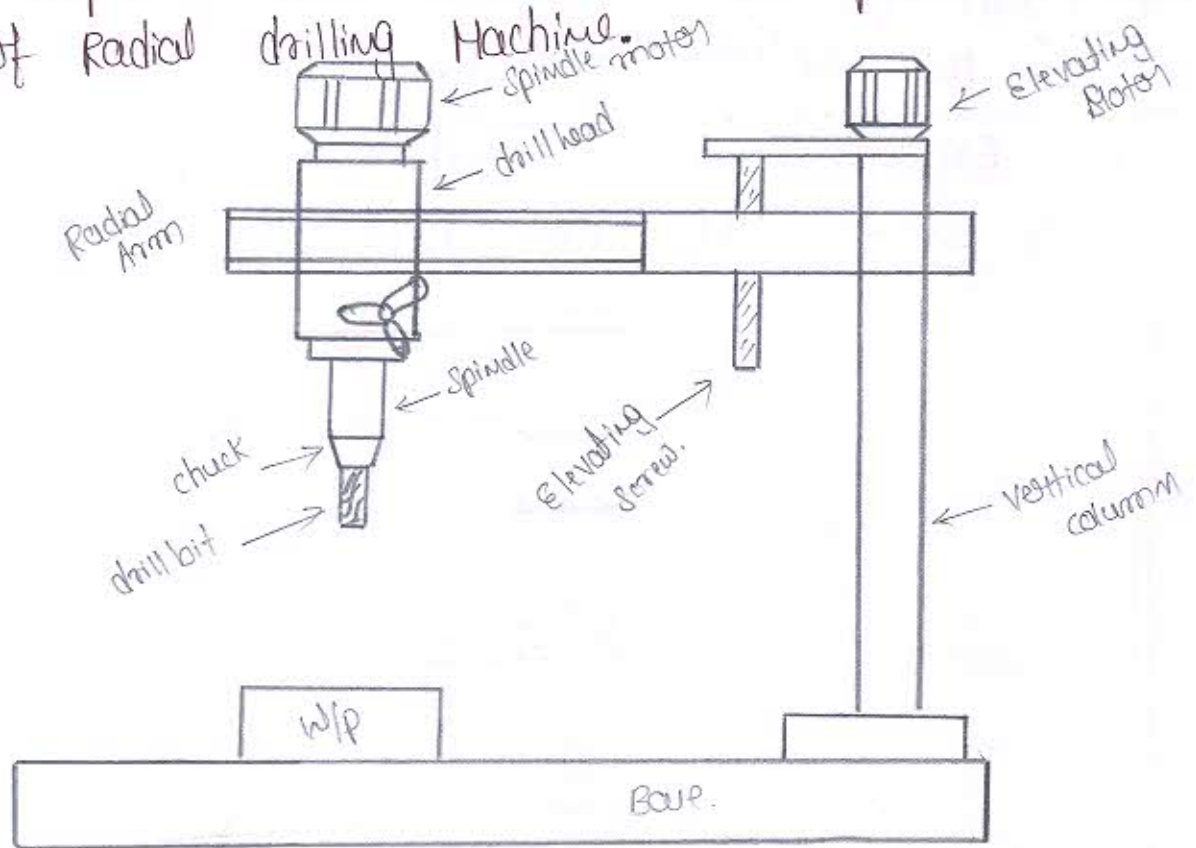
Head stock: Head stock is the main body parts which are placed at left side of bed. It is serve as holding device for the gear chain. Spindle, driving pulley etc..

Tail stock: Tail stock situated on bed. It is placed at Right hand side of the bed.

Lead screw: Lead screw is situated at the bottom side of bed which is used to move the carriage automatically during thread cutting.

Carriage: It is situated between the head stock and tailstock. It is used to hold and move the tool part on the bed vertically and horizontally.

(3) Explain with a neat sketch parts and working of Radial drilling Machine.



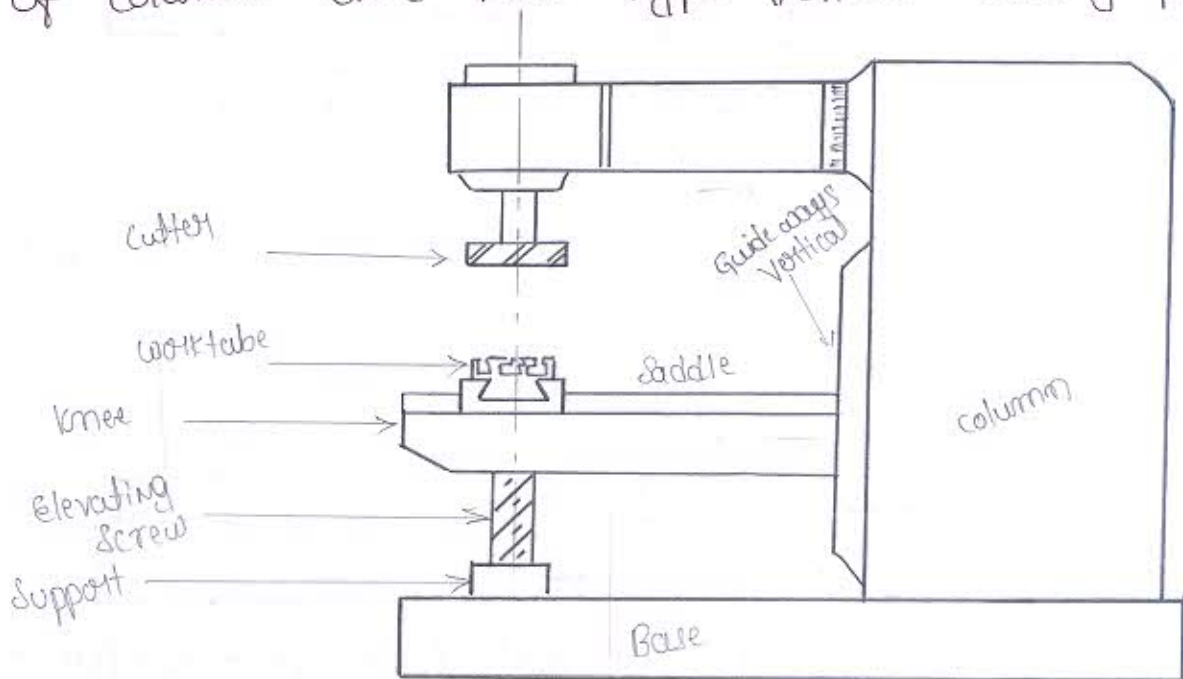
Radial Arm: The Radial Arm is mounted on the column parallel to the base and can be adjusted vertically. The vertical front surface is accurately machined to provide guide ways for the drill head. The drill head can be adjusted along these guide ways according to the location of the work.

Drill head :- The drill head is mounted on the Radial Arm and houses all mechanism for driving the drill at different speeds and at different feed. A motor is mounted on top of the drill head for this purpose.

### Working principle

The work is mounted on the table or when the workpiece is very large it may be placed on the floor or in a pit. Then the position of the Arm and the drill head is altered so that the drill bit may be pointed exactly on the location where the hole is to be drilled. When several holes are drilled on a large workpiece. The drill head is moved from the one position to the other after drilling the hole without altering the setting of the work.

(4) Explain with a neat sketch parts and working of column and knee type vertical milling Machine.



Base :- It is made of cast iron and supports all the other parts of the machine tool. A vertical column is mounted upon the base.

Column: It is mounted upon the base and is box shaped. It houses the mechanisms for providing drive for the spindle. The front vertical face of the column is machined accurately to form dovetail guideways for the knee to move up and down.

Knee: It slides up and down on the guideways for the column. An elevating screw mounted on the base obtains this movement.

Saddle: It is mounted on the guideways of the knee and moves towards or away from the face of the column.

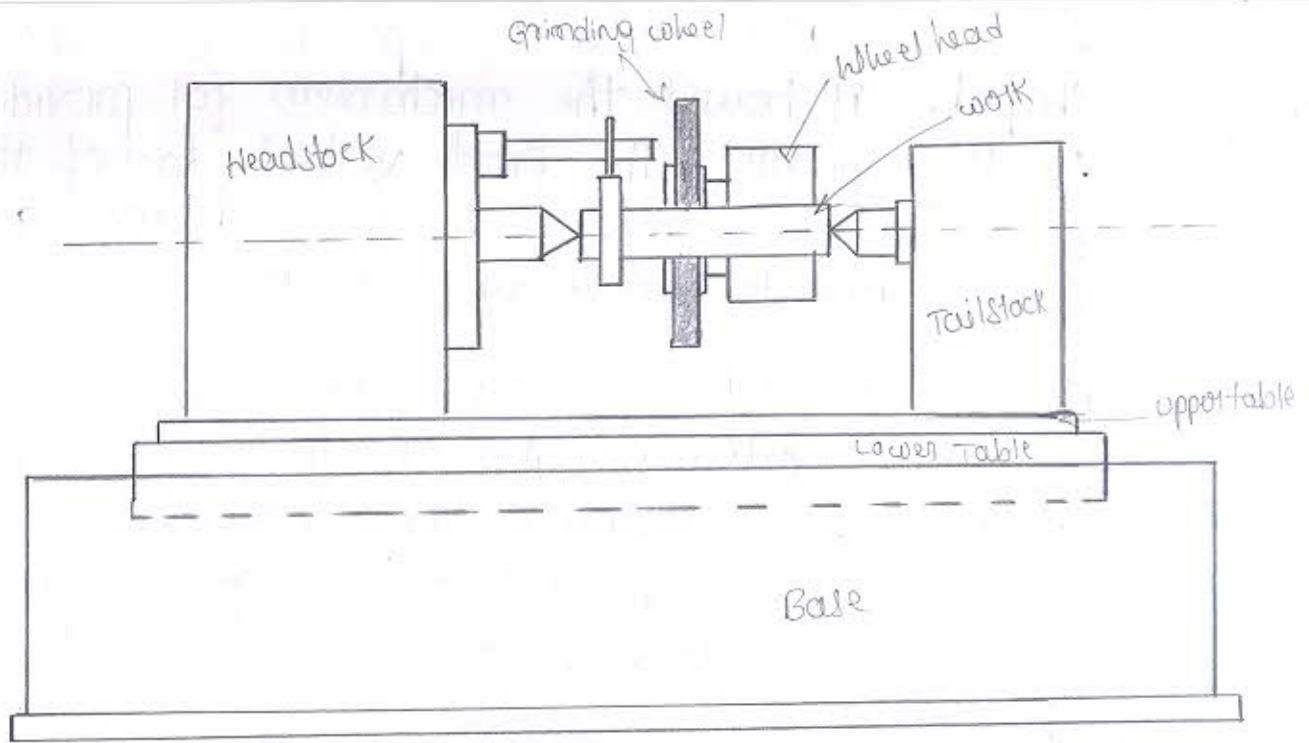
Spindle: It is located in the upper part of the column. It receives power from the motor through belt, gears and clutches. The front end of the spindle has got a taper hole with which the cutters are held with different cutter holding devices.

### Working principle

This machine is very similar to a horizontal milling machine. The only difference is the spindle is vertical. The work table may or may not have swivelling features. The spindle head may be swiveled at an angle, permitting the milling cutter to work on angular surfaces. In some machines the spindle can also be adjusted up or down relative to the work piece. This machine works using end milling and face milling cutters. This machine is adapted for machining grooves, slots, and flat surfaces.

5.

(a) Explain with a neat sketch working principle of cylindrical surface grinding process.



The term "cylindrical" refers to a set of grinding machines employing centers to mount the workpiece. It could be external or internal grinding plain grinder is the most popular of the external grinding machine. The base houses all the components including the driving mechanism.

A carrier carries a spindle on which the grinding wheel is mounted. The carrier is located behind the base and along the cross ways. It can be moved along the cross way perpendicular to the axis of the centers. The wheel rotates at high RPM - upto 1500, and is driven by motor. The table movement can be changed by Reversing Lever located in the front of the base.

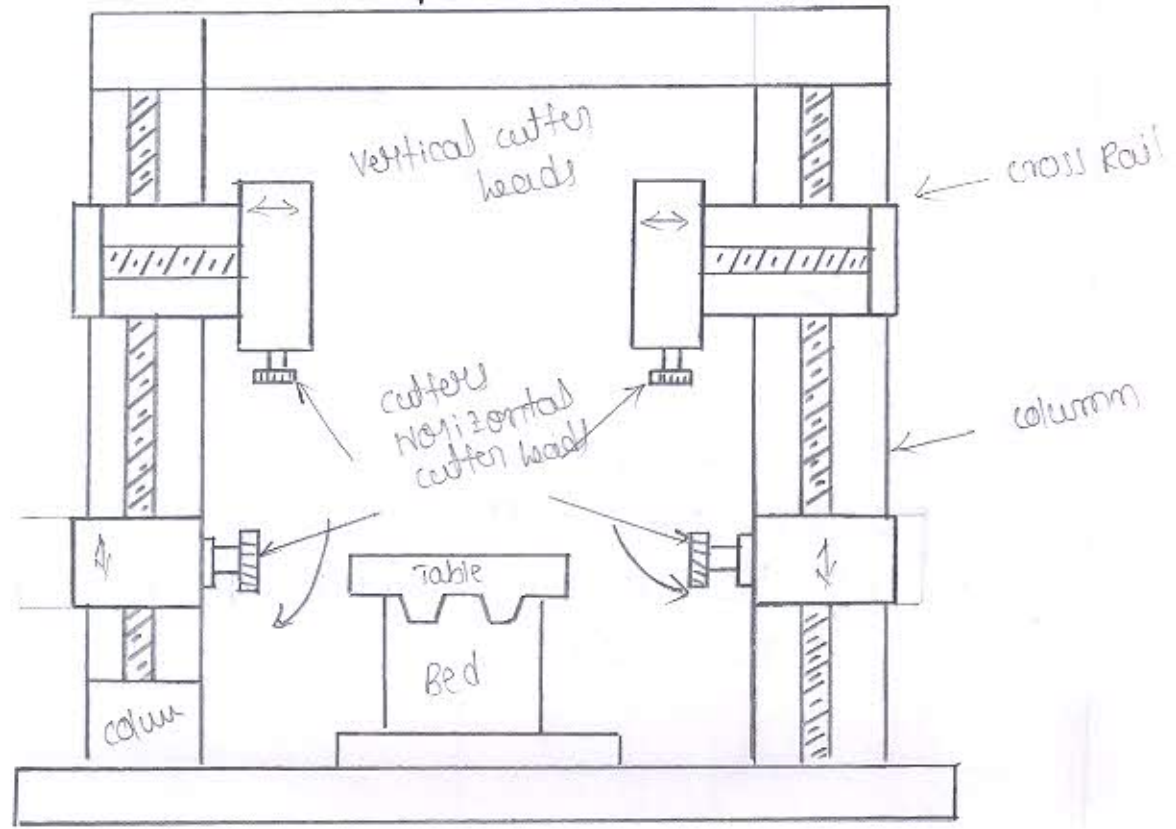
b) Explain briefly the classifications of Milling Machines

Milling Machines can be classified into different categories depending upon their construction specification and operations. The choice of any particular machine is primarily determined by nature of the work to be done, its size, geometry and operations to be performed.

The typical classification of milling machines on the basis of its construction is given below.

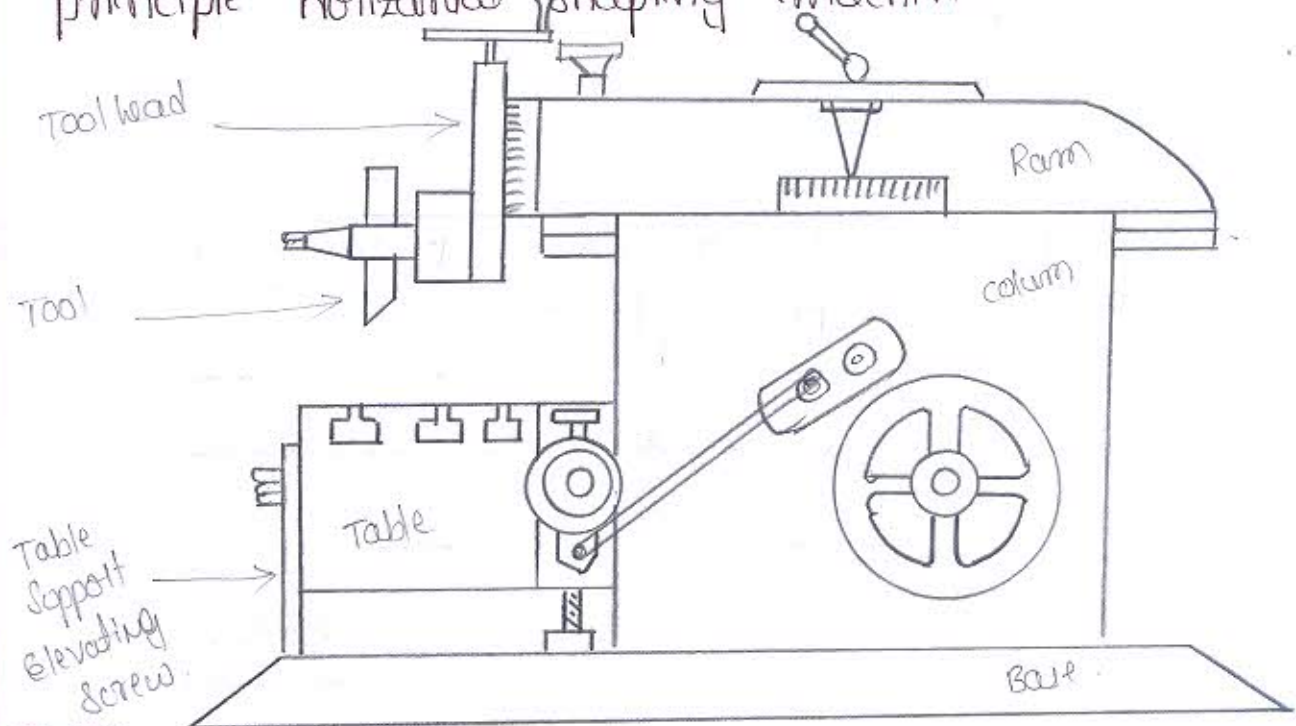
- (i) column and knee type milling machine
  - (a) head milling machine
  - (b) plain milling machine
  - (c) universal milling machine
  - (d) omniversal milling machine
  - (e) vertical milling machine.
- (ii) Fixed Bed type Milling machine
  - (a) Simplex milling
  - (b) Duplex milling
  - (c) Triplex milling
- (iii) Special type Milling machine
  - (a) Rotary table milling
  - (b) Drum milling
  - (c) planetary milling
  - (d) Tracer controlled milling.

(B) Explain with a neat sketch working principle of double base planet.



This heavy duty large machine, called plano-miller, look like planer here single point tools are replaced by one or a number of milling heads, this is generally used for machining a number of longitudinal flat surfaces simultaneously such as lathe beds, table and bed of planer etc - Modern plano-millers are provided with high power driven spindles powered to the extent of 100 hp. and the rate of metal removed is tremendous. The use of this machine is limited to production work only and is considered ultimate in metal removing capacity.

(7) Describe with a neat sketch parts and working principle horizontal shaping machine.



Base:

The base is hollow and is made of cast iron. It provides the necessary support for all the other parts of the machine. It is rigidly bolted to the floor of the workshop.



Column: It is a box like casting mounted vertically on top of the base. Two accurate guideways are machined on the top of the column.

Cross Rail: It is mounted on the front vertical guideways of the column. The table may be raised or lowered by adjusting the cross rail. The top and sides of the table are accurately machined and have T-slots.

Ram: Ram supports the toolhead on its front. It reciprocates on the accurately machined guideways on the top of the column.

Tool head: The tool head is fitted on the face of the ram and holds the tool rigidly.

### Working principle

- ⇒ The tool reciprocates and gets its drive with the help of a mechanism which changes rotary motion into reciprocating motion.
- ⇒ The length of the stroke of a shaper is slightly greater than the cut to be taken.
- ⇒ The work piece is held in a holding device.
- ⇒ The tool is held rigidly in a post mounted on the ram of the shaper.
- ⇒ The ram reciprocates to and fro, hence the tool cuts the work during the cutting stroke, i.e. during forward stroke.
- ⇒ No cutting takes place during the return stroke.