

## GENERAL MACHINIST

### 4 MARK QUESTIONS

#### 1. What is turning?

Turning is the process of machining a work piece to the required shape and size by moving the cutting tool either parallel or perpendicular to the axis of rotation of the work piece is known as turning

#### 2. What are the important parts of a lathe?

- |                   |                             |
|-------------------|-----------------------------|
| 1. Bed            | 2. Headstock                |
| 3. Spindle        | 4. Tailstock                |
| 4. Tailstock      | 6. Feed mechanism           |
| 5. Carriage       | 7. Lead screw               |
| a. Saddle         | 8. Feed rod                 |
| b. Apron          | 9. Thread cutting mechanism |
| c. Cross-slide    |                             |
| d. Compound rest  |                             |
| e. Compound slide |                             |
| f. Tool post      |                             |

#### 3. Mention any four operations performed in a lathe.

Grooving, under cutting  
Chambering Knurling

#### 4. What are the uses of a tool room lathe?

- i) A tool room lathe has similar features of an engine lathe, but is accurately built and Has wide range of spindle speeds to perform precise operations and different feeds.  
ii) It is costlier than a Centre lathe.  
iii) This is mainly used for precision works like manufacturing tools, Dies, jigs, fixtures and gauges.

#### 5. Mention the special feature of turret and capstan lathe?

- i) Turret and Capstan lathes are known as semi-automatic lathes.  
ii) These lathes are used for production work where large quantities of identical work pieces  
iii) These lathes are used are called semi-automatic lathes as some of the tasks are performed by The operators and the rest by the machines themselves.

#### 6. What is swing diameter in a lathe?

The swing diameter over bed - It refers to the largest diameter of the Work that will be rotated without touching the bed.

The swing diameter over carriage - It is the largest diameter of the work that Will revolve over the saddle.

#### 7. What are the advantages of a V-bed?

- i) Carriage is positioned in between the headstock and tailstock and slides On the bed guide ways.  
ii) Inverted 'V' shaped guide ways are useful in better guide and Accurate alignment of saddle and tailstock.

#### 8. Mention two types of tool post?

- |                           |                        |
|---------------------------|------------------------|
| 1. Single screw tool post | 3. Four way tool post  |
| 2. Four bolt tool post    | 4. Open side tool post |

**9. What is the use of tumbler gears?**

Moving the carriage towards or away from the headstock, this mechanism along With feed rod or lead screw is used.

**10. What are the uses of lead screw in a lathe?**

Lead screw is used to move the carriage towards and away from the headstock During thread cutting. The direction of carriage movement depends upon the direction of Rotation of the leadscrew. When the lead screw is kept stationary, the half nuts are engaged With the lead screw to keep the carriage locked at the required position.

**11. What are the uses of back gears in a lathe?**

1. The spindle gets four direct speeds through the cone pulley and four slower speeds Through the back gears.
2. Slower speeds obtained by this arrangement are useful when turning on larger Work pieces and cutting coarse threads.

**12. Mention any four work holding devices used in a lathe.**

1. Chucks
2. Face plate
3. Driving plate
4. Catch plate
5. Carriers

**13. Mention the use of a face plate.**

Faceplate is used to hold large, heavy and irregular shaped work pieces which can Not be conveniently held between centers. It is a circular disc bored out and threaded to fit To the nose of the lathe spindle.

**14. State any two differences between the processes of reaming and boring.****Reaming:**

The tool used for enlarging and finishing a previously drilled hole is known as a reamer. It is a multi-tooth cutter and removes smaller amount of material. It gives a better finish and Accurate dimension.

**Boring:**

1. To finish a hole accurately and bring it to the required size
2. To machine the internal surface of the hole already produced in casting
3. to correct out of roundness of the hole
4. To correct the location of the hole as the boring tool follows independent path with Respect to the hole

**15. Why is spot facing done?**

- i) Spot facing is the operation of smoothing and squaring the surface around a hole
  - ii) It is done to provide proper seating for a nut or the head of a screw
- Counter bore or a special spot facing tool may be employed for this purpose

**16. Define 'cutting speed' in a drilling machine.**

The cutting speed in a drilling operation refers to the peripheral speed of a point on the Cutting edge of the drill. It is usually expressed in meters per minute. The cutting speed (v)

Calculated as  $\frac{\pi dn}{1000}$  m/min      Cutting speed (C.S) = ----- m per min

**17. Name any four work holding devices used in a drilling machine.**

1. Drill vise
2. Step block
3. Step block
4. 'T' - bolts and clamps

4. V – block

5. Angle plate

**18. Name any four important parts of a shaping machine.**

Base, column, cross rail, Ram, Tool Head,

**19. What is the use of crank & slotted link mechanism?**

Crank and slotted link mechanism of a crank type shaper converts the rotation of an Electric motor into reciprocating movement of the ram. Though the lengths of both the Forward and return strokes are equal, the ram travels at a faster speed during return stroke

**20. Define 'feed' in a shaping machine.**

Feed (S) is the relative movement of the work or tool in a direction perpendicular to the axis of reciprocation of the ram per double stroke. It is expressed in mm per stroke.

**21. Name any two points in specifying the size of a shaping machine.**

- i) Type of motor
- ii) Movement of the Ram
- iii). Horse power of the motor
- iv). Cutting to return stroke ratio

**22. What is the use of a clapper box?**

The clapper block fits securely inside the clapper box to provide a rigid tool support During forward stroke. On the return stroke, a slight frictional drag of the tool on the work Lifts the block out of the clapper box and prevents the tool cutting edge from dragging on The work surface.

**23. What is the use of swivel tool head of a shaping machine?**

An angular cut is made at any angle other than a right angle to the horizontal or to the Vertical plane. The work is set on the table and the vertical slide of the tool head is swiveled To the required angle either towards left or towards right from the vertical position.

**24. What is grinding?**

Grinding is a metal cutting operation like any other process of machining removing Metal in comparatively smaller volume. The cutting tool used is an abrasive wheel having Many numbers of cutting edges

**25. Name any four grinding machines.**

- 1. Hand grinding machine
- 2. Bench grinding machine
- 3. Floor stand grinding machine
- 4. Flexible shaft grinding machine

**26. What is Centre less grinding?**

Centre less grinding is a method of grinding external cylindrical, tapered and formed Surfaces on work pieces that are not held and rotated between centers or in chucks.

**27. What are the four types of surface grinders?**

- 1. Horizontal spindle and reciprocating table type
- 2. Horizontal spindle and rotary table
- 3. Vertical spindle and reciprocating table type
- 4. Vertical spindle and rotary table type

**28. List any four operations performed in a grinding machine.**

- 1. Cylindrical grinding
- 2. Taper grinding
- 3. Gear grinding
- 4. Thread grinding

**29. What are the effects of dry grinding?**

Dry grinding is the method of doing grinding operation without applying coolant. Dry Grinding produces undesirable effects on work surfaces. It leads to burring & discoloration of work surfaces. The cutting edges of the grinding wheel lose their cutting capacity. So, dry Grinding should better be avoided.

**30. Name any four types of bonds.**

- 1. Vitrified
- 2. Silicate
- 3. Shellac
- 4. Resinoid

**31. What is glazing?**

Glazing is the condition of the grinding wheel in which the cutting edges or the face of the Wheel takes a glass-like appearance. Glazing takes place if the wheel is rotated at very high Speeds and is made with harder bonds. Rotating the wheel at lesser speeds and using soft Bonds are the remedies. The glazed wheels are dressed to have fresh, sharp cutting edges.

**32. What is loading?**

The wheel is loaded if the particles of the metal being ground adhere to the wheel. The Openings or pores of the wheel face are filled up with the metal. It is caused by grinding a softer material or by using a very hard bonded wheels and running it very slowly. It may also take place if very deep cuts are taken by not using the right type of coolant.

**33. What are the reasons for chattering?**

The wavy pattern of crisscross lines are visible on the ground surface some times. This Condition is known as chattering. It takes place when the spindle bearings are not fitted correctly and because of the imbalance of the grinding wheel.

**34. What is milling?**

Milling is a process of removing metal by feeding the work against a rotating multipoint Cutter. The machine tool intended for this purpose is known as milling machine

**35. What are the types of milling machines?**

1. Column and knee type
  - a) Plain milling machine
  - b) Universal milling machine
  - c) Omniversal milling machine
  - d) Vertical milling machine

**36. Planer type milling machine**

Heavy work pieces are mounted and machined on the machine. The work mounted on the table is moved vertically, longitudinally and crosswise against the rotating cutter. The table cannot be rotated. It is also called as horizontal milling machine because the cutter rotate horizontal plane.

**37. How is the size of a milling machine specified?**

1. The size of the table (length and width)
2. The maximum lengths of longitudinal, cross and vertical travel of the table.
3. Number of spindle speeds, number of feeds
4. Spindle nose taper
5. Power required
6. Net weight of the machine

**38. Name the fundamental milling processes.**

1. Peripheral milling
2. Face milling

**39. What are the types of peripheral milling?**

1. up milling
2. Down milling

**40. Name four work holding devices in a milling machine.**

- i)'T' – bolts
- iii)clamps.
- 'ii) V' – blocks
- iv) Vise

**41. What is indexing?**

Indexing is the method of dividing the periphery of a piece of work into any number of equal parts. The attachment used for performing indexing is known as indexing head.

**42. What is the use of indexing head?**

The indexing operation can be adapted for cutting gears, ratchet wheels, keyways, fluted Drills, taps and reamers. The indexing head serves as an attachment for holding and indexing

**43. What are the types of indexing head?**

1. Plain or simple dividing head
2. Universal dividing head

3. Optical dividing head.

**44. What are the methods of indexing?**

1. Direct or rapid indexing
2. Plain or simple indexing
3. Compound indexing
4. Differential indexing
5. Angular indexing

**45. What is hydraulics?**

The volume of a liquid cannot be changed by applying pressure.

This property of Liquids forms the base of study of hydraulics.

**46. Define a hydraulic pump?**

Hydraulic pump is a device, which transforms mechanical energy into hydraulic energy. It serves as the heart of the hydraulic circuit. It provides the force used to move the load in the circuit but the pressure of the circuit is not developed by the pump.

**47. What is the principle of a hydraulic pump?**

Partial vacuum is created at the inlet port because of the rotation of the impeller. Hydraulic liquid is forced to flow from the reservoir because of this vacuum through a pipeline and is pumped out through the outlet.

**48. Mention the types of hydraulic pumps.**

1. Gear pump
2. Vane pump
3. Lobe pump

**49. What is a hydraulic motor?**

It is a device used to transform hydraulic energy into mechanical energy. The capacity of the hydraulic motor depends upon the quantity of the hydraulic Energy that it receives and its mechanical efficiency.

**50. What are the important parts of a centrifugal pump?**

1. Prime mover
2. Impeller
3. Casing
4. Suction pipe
5. Delivery pipe

**51. What are the uses of a reciprocating pump?**

1. Pumping sea water, ship and marine field
2. Air pumping devices
3. Filling water in small grade boilers
4. Oil pumping

**52. What is a hydraulic cylinder?**

A hydraulic cylinder converts hydraulic energy into linear mechanical energy. It also called as linear actuator. The piston placed inside a cylinder can be made to move to required distance at a required point of time by the liquid.

**53. What are the uses of a hydraulic cylinder?**

Cylinders are used to begin or stop any stroke movement or to clamp an object at a particular position.

**54. What are the valves used to control the flow of hydraulic liquid?**

A. Valves used to control the amount of flow in hydraulic circuits

- a. Gate valve.
- b. Globe valve

c. Needle valve.      Bye pass valve      Isolation valve

B. Direction control valves

- a. Check valve
- i) Swing valve      ii) Poppet valve      iii) Pilot valve

b. Two way plunger valve      c. Three way plunger valve      d. Four way plunger valve

**55. List out the types electrical motors.**

- 1) D.C. Motor
- 2) A.C. Motor

i) Three phase induction motor

- a) Squirrel cage induction motor
- b) Slip ring induction motor

ii) Single phase induction motor

- a) Split phase induction motor                      b) Capacitor induction motor  
c) Repulsion motor                                      d) Shaded pole motor

**56. What are the types of starters used in induction motors?**

- i) Direct – on – line starter (D.O.L Starter)      ii) Star – delta starter  
iii) Auto transformer starter                              iv) Rotor resistance starter (for slip ring motor)

**57. What are the safety devices fitted in starters to protect the induction motors?**

- No volt coil.    Overload Relay

**58. What is the need of a starter in a motor?**

When induction motors are directly switched on to supply, it takes about five to six times of full load current. This initial excessive current causes damages to the motor and supply wires. Starters are used to limit the inrush of starting line current and full current is supplied when the motor picks up speed. It consists of protective elements like no volt coil and over load relays.

**59. How is welding done?**

Welding can be defined as the process of joining two metal parts by applying heat  
Welding is useful in making permanent joints

**60. What are the methods of welding?**

1. Plastic welding
2. Fusion welding

**61. How is the welding electrodes specified?**

The size of the electrodes is specified by the length and its diameter. They are available to a maximum of 12 mm diameter and 450 mm length. The size of the electrode increases with the current used. In manual welding, the size of the electrode changes according to the thickness of the metal parts. Spring like electrodes are used in automatic welding.

**62. What are the types of electrodes?**

1. Consumable electrode
2. Non-consumable electrode

**63. Name the three types of flames generated in gas welding?**

1. Neutral flame
2. Carburizing flame
3. Oxidizing flame

**64. Write short notes on filler rods used in gas welding?**

Filler rods used in gas welding supply the additional metal in making joints. These Rods are melted by the gas flame and deposited over the parts of the joint. Generally the Filler rods are made of the same metal as that of the parts of the joint.

**65. Write any four advantages of gas welding?**

1. Applied for different classes of work
2. Welding temperature is controlled easily
3. The quantity of filler metal added in the joint can easily be controlled
4. The cost of the welding unit is less
5. The cost of maintenance is less

**66. What are the limitations of gas welding?**

1. Intended for welding thin work pieces only
2. The process of welding is slow
3. The time taken by the gas flame to heat the metal is more when compared with Electric arc
4. The strength of the joint is less

**67. What are the types of welded joints?**

1. Butt joint
2. Lap joint
3. T-Joint
4. Corner joint
5. Flange joint

**68. Define - Numerical Control.**

Numerical control can be defined as a system in which actions of a machine tool are controlled by recorded information's in the form of numerical data.

**69. What do you mean by software of a NC system?**

Software of a NC system can be referred to as items comprising of instructions (programs), languages used to write these programs and a variety of input media.

**70. What is Machine Control Unit?**

Machine Control Unit consists of electronic circuits (hardware) that are useful in reading and interpreting the instructions (NC program) fed by means of input media and convert them into mechanical actions of the machine tool.

**71. What are the types of MCU?**

MCU may be of three types

- (i) Inbuilt type                      (ii) Swing around type                      (iii) Standalone type

**72. Mention the functions of input reading unit?**

1. To accept the input media like punched cards, punched tapes, magnetic tapes and floppy disks
2. To send them into a reading unit to extract the information stored in them
3. To process the collected information                      4. To collect the input media to be used again

**73. How is processing unit important in a NC system?**

The processing unit serves as a link between the memory unit and output channel. The processor does the duty of coordinating and controlling the other units of the MCU. Information received from the buffer are processed here and appropriate signals are given to various units at particular points of time. Until a few years ago, processors made use of vacuum tubes and transistors. But recently, when the era of Integrated Circuits (IC) has dawn, processors are driven by ICs.

**74. Write short notes on 'Output channels'.**

Output channels are the pins found on ICs or the wires coming out of Processors. These channels emit electric pulses of very low voltage / current. The pulses are the result of processed information based on the NC program. In order to drive or actuate various slides of the machines, the pulses are amplified by means of electronic or electro - magnetic amplifiers or thyristors.

**75. What is manual control unit?**

Manual control unit consists of dials and switches to be operated by the Operator. It may also have a display unit to provide useful information's to the operator.

**76. What are the uses of manual control unit?**

1. Switch on and off the machine                      2. Load and unload the work pieces and
3. Change the tools in certain types of machines

**77. How are NC machine tools classified?**

*A. According to the type of power to the drives*

- a. Electrical                      b. Hydraulic                      c. Pneumatic

*B. According to motion control system of slides*

- a. Point- to - point system  
b. Contour (or) continuous path system

*C. According to the feedback system*

- a. Open loop system                      b. Closed loop system

*D. According to axis identification*

- a. 2- axis                      b. 3- axis                      c. 4- axis                      d. 5- axis

**78. What is motion control system?**

The cutting tool and the work are located at certain positions in NC machine. During the machining, they are moved from their positions with relation to each other. The system involved in moving the cutting tool and the work is known as motion control system.

**79. Define - Part program.**

A series of instructions describing the part to be produced in an acceptable form to the control unit or computer is known as part program.

1. Manual part programming
2. Computer assisted part programming

**80. Name some high level languages used to write NC programs?**

APT (Automatically Programmed Tools), ADAPT, EXAPT, SPLIT, PROMPT are some of the high level languages used for writing NC programs

**81. What is Direct Numerical Control?**

A manufacturing system in which several NC machines are connected to and controlled by a remotely located main frame computer, is known as Direct Numerical Control

**82. What is Adaptive Control?**

Adaptive control is a system in which an important feature of decision making is employed during machining. When a component is being manufactured, some important process variables like torque, force and temperature are measured.

**83. What is direct loss?**

Direct loss is the expenditure incurred for repairing the machine tools and getting them back in action.

**84. What do you mean by indirect loss?**

Indirect losses happen by the loss of income for the disturbed production. The management has to pay the labourers their wages. It will also be earning a bad name due to non-delivery of the products to its customers. So, it is necessary to plan the

**85. What is machine tool maintenance?**

The term machine tools refers not only the cutting tool. It means the machines, cutting tools, attachments, measuring instruments and accessories.

**86. What is the objective of maintenance?**

The main objective of planned maintenance programme is to increase the production by keeping the machine tools always ready in good condition. It is done by keeping the machine tools to perform all the activities correctly with the required accuracy at desired

Speed with full safety protection.

**87. What are the types of maintenance?**

There are different types of maintenance and they are

1. Routine maintenance
  - a. Daily maintenance
  - b. Weekly maintenance
2. Preventive maintenance
3. Breakdown maintenance
4. Capital repairs or Corrective maintenance

**88. What is preventive maintenance?**

In order to avoid sudden breakdown of machine tools and major repairs, a complete maintenance programmer is charted out. This will ensure that there is no slip in the rate of production.

**89. What is 'wear'?**

Due to continuous working of a machine tool and the nature of work performed on it, wear and tear is observed in the sliding parts of machine tools. The accuracy of the products is affected. In remedy, it is necessary to repair the said machine tools. The affected parts are to be replaced if necessary.

**90. What is backlash?**

Some slackness is observed in holding of parts, meshing gears or bolt and subassembly. This slackness is known as backlash. If the amount of backlash is more in the case of mating gears, they should be replaced. The wear and tear on the gears should be observed once in a week time

**91. What is lubrication?**

Rotating and sliding parts, which make contact with other parts, are subjected to wear due to friction. Viscous oil called lubricant is applied to these parts to avoid direct contact between them. The process of reducing friction is called lubrication.

**9X2. What are the parts which need to be lubricated?**

1. Mechanisms of hydraulic systems
2. Guide ways and sliding parts
3. Rotating shafts
4. Gear box
5. Feed box
6. Speed changing mechanisms
7. Bearings

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**1. List out the types of lathe.**

Various designs and constructions of lathe have been developed to suit different Machining conditions and usage. The following are the different types of lathe

1. Speed lathe
  - a. Woodworking lathe
  - b. Centering lathe
  - c. Polishing lathe
  - d. Metal spinning lathe
2. Engine lathe
  - a. Belt driven lathe
  - b. Individual motor driven lathe
  - c. Gear head lathe
3. Bench lathe
4. Tool room lathe
5. Semi-automatic lathe
  - a. Capstan lathe
  - b. Turret lathe
6. Automatic lathe
7. Special purpose lathe
  - a. Wheel lathe
  - b. Gap bed lathe
  - c. 'T' lathe
  - d. Duplicating lathe

**2. How is the size of a lathe specified?**

The size of a lathe is specified by the following points

1. The length of the bed
2. Maximum distance between live and dead centers.
3. The height of centers from the bed
4. The swing diameter

The swing diameter over bed - It refers to the largest diameter of the Work that will be rotated without touching the bed

The swing diameter over carriage - It is the largest diameter of the work that Will revolve over the saddle.

5. The bore diameter of the spindle
6. The width of the bed
7. The type of the bed
8. Pitch value of the lead screw
9. Horse power of the motor
10. Number and range of spindle speeds
11. Number of feeds
12. Spindle nose diameter
13. Floor space required
14. The type of the machine

### 3. Mention the differences between a turret lathe and a capstan lathe?

<b>Turret lathe</b>	<b>Capstan lathe</b>
1. Turret tool head is directly fitted on the saddle and both of them appear like One unit.	1. Turret head is mounted on a slide called ram which is mounted on the saddle
2. Saddle is moved to provide feed to the tool	2. To provide feed to the tool, saddle is locked at a particular point and the ram is moved
3. It is difficult to move the saddle for feed	3. It is easy to move the ram for feed
4. As the saddle can be moved along the entire length of the bed, it is suitable for longer work pieces	4. As the movement of the ram is limited, it is suitable for machining shorter work pieces only
5. To index the turret tool head, clamping lever is released and the turret is rotated manually	5. When the hand wheel for the ram is reversed, the turret tool head is indexed automatically
6. Limit dogs are used to control the distance of tool movement	6. To control the distance of tool movement, feed stop screws are provided at the rear side of the turret
7. Some turret lathes have the facility of moving the turret at right angles to the lathe axis	7. No such facility
8. Heavy and sturdy	8. Lighter in construction
9. Suitable for machining heavy and large work pieces	9. Only small and light work pieces are machined
10. Machining can be done by providing more depth of cut and feed	10. Only limited amount of feed and depth of cut are provided for machining

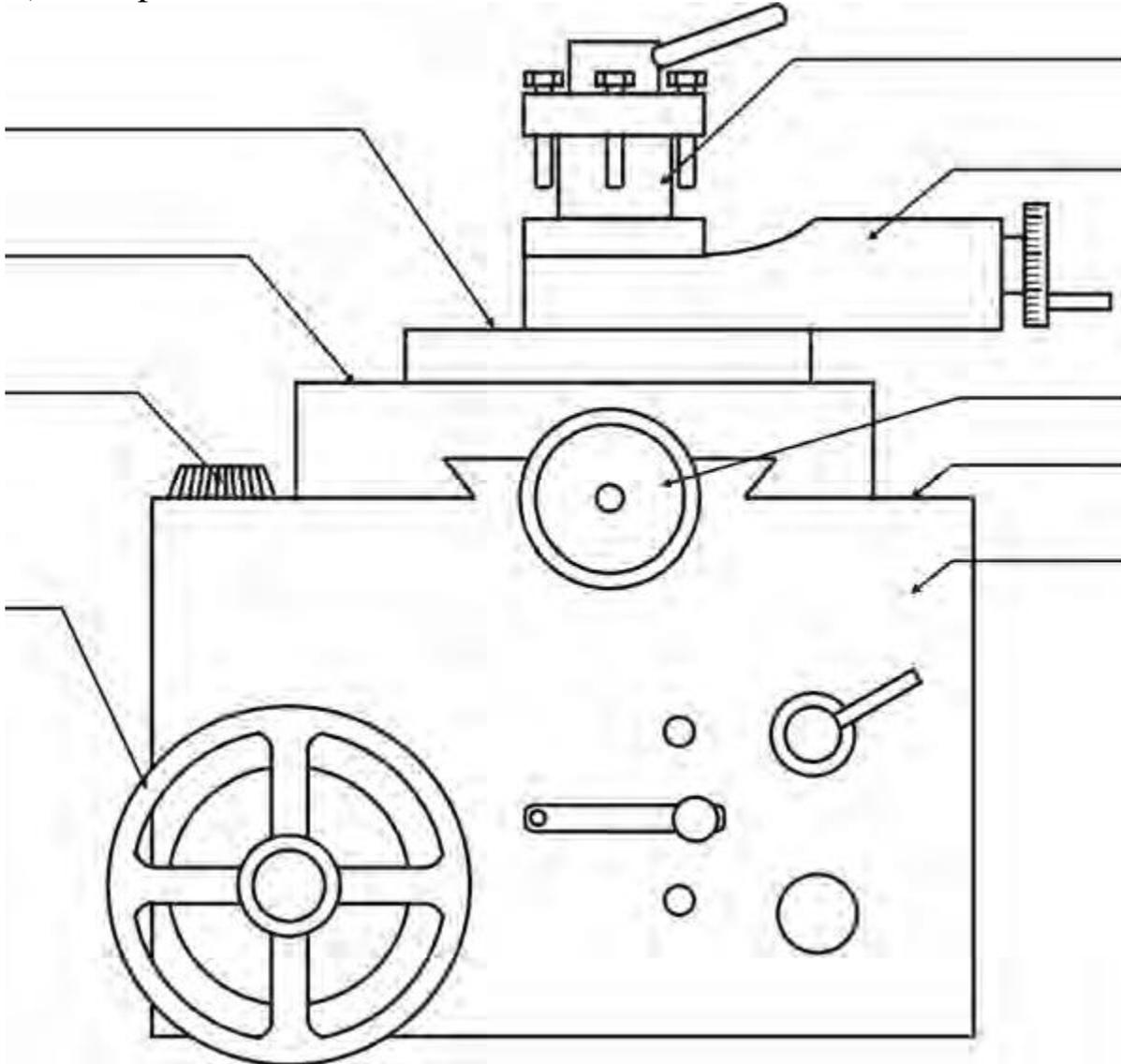
#### 4. Mention the differences between a engine lathe and a turret lathe? [www.Padasalai.Net](http://www.Padasalai.Net)

<b>Engine lathe</b>	<b>Turret &amp; Capstan lathe</b>
1. There is only one tool post	1. There are two tool posts four way tool post and rear tool post
2. Tailstock is located at the right side of the bed	2. Tailstock is replaced by an hexagonal tool head called turret
3. Only one cutting tool can be held in the tailstock	3. A minimum of six tools can be held in the turret
4. No provision to control the tool movement (feed) automatically	4. Turret movement can be controlled automatically
5. Only one tool can be put into Machining at a time. Tools have to be set every time according to the operation to be performed	5. More tools can be set on the turret and each of them can be set at the work one by one automatically
6. Setting of tools will take more time	6. Setting of cutting tool is easy
7. A skilled operator is necessary to work on the machine	7. After the initial settings are made, a semi-skilled operator can operate the machine
8. The machine has to be stopped to change the tool	8. Tools can be indexed even when the machine is on
9. The production cost is high	9. Production cost is reduced as the rate of production is more
10. Motors with 3 to 5 HP are used	10. Motors with 15 HP are used

**5. What are the parts found in the carriage of a lathe? Explain any two.** www.Padasalai.Net

Carriage is located between the headstock and tailstock on the lathe bed guideways. It can be moved along the bed either towards or away from the headstock. It has several parts to support, move and control the cutting tool. The parts of the carriage are:

- a) Saddle
- b) Apron
- c) cross-slide
- d) Compound rest
- e) Compound slide
- f) Tool post



Cross feed hand wheel  
Longitudinal

Saddle  
Apron Feed

Tool post  
Hand wheel

Compound slide

### **1. List out the types drilling machines.**

The different types of drilling machines are:

1. Portable drilling machine (or) Hand drilling machine
2. Sensitive drilling machine (or) Bench drilling machine
3. Upright drilling machine
4. Radial drilling machine
5. Gang drilling machine
6. Multiple spindle drilling machine
7. Deep hole drilling machine

### **3. How is the size of a drilling machine specified?**

i) Drilling machines are specified according to their type. A portable drilling machine is specified by the maximum diameter of the drill that it can handle.

ii) The size of the sensitive and upright drilling machines are specified by the size of the largest work piece that can be centered under the spindle. It is slightly smaller than twice the distance between the face of the column and the axis of the spindle.

iii) Particulars such as maximum size of the drill that the machine can operate, diameter of the table, maximum travel of the spindle, numbers and range of spindle speeds and feeds available, Morse taper number of the drill spindle, floor space required, weight of the machine, power input are also needed to specify the machine completely.

iv) The size of the radial drilling machine is specified by the diameter of the column and length of the radial arm

### **2. Draw and explain a bench drilling machine.**

It is designed for drilling small holes at high speeds in light jobs. High speed and hand feed are necessary for drilling small holes. The base of the machine is mounted either on bench or on the floor by means of bolts and nuts. It can handle drills up to 15.5mm of diameter. The drill is fed into the work purely by hand. The operator can sense the progress of the drill into the work because of hand feed. The machine is named so because of this reason. Sensitive drilling

machine consists of a base, column, table, spindle, drill head and the driving mechanism.

**Base**

The base is made of cast iron and so can withstand vibrations. It may be mounted on a bench or on the floor. It supports all the other parts of the machine on it. The column stands vertically on the base at one end. It supports the work table and the drill head. The drill head has drill spindle and the driving motor on either side of the column.

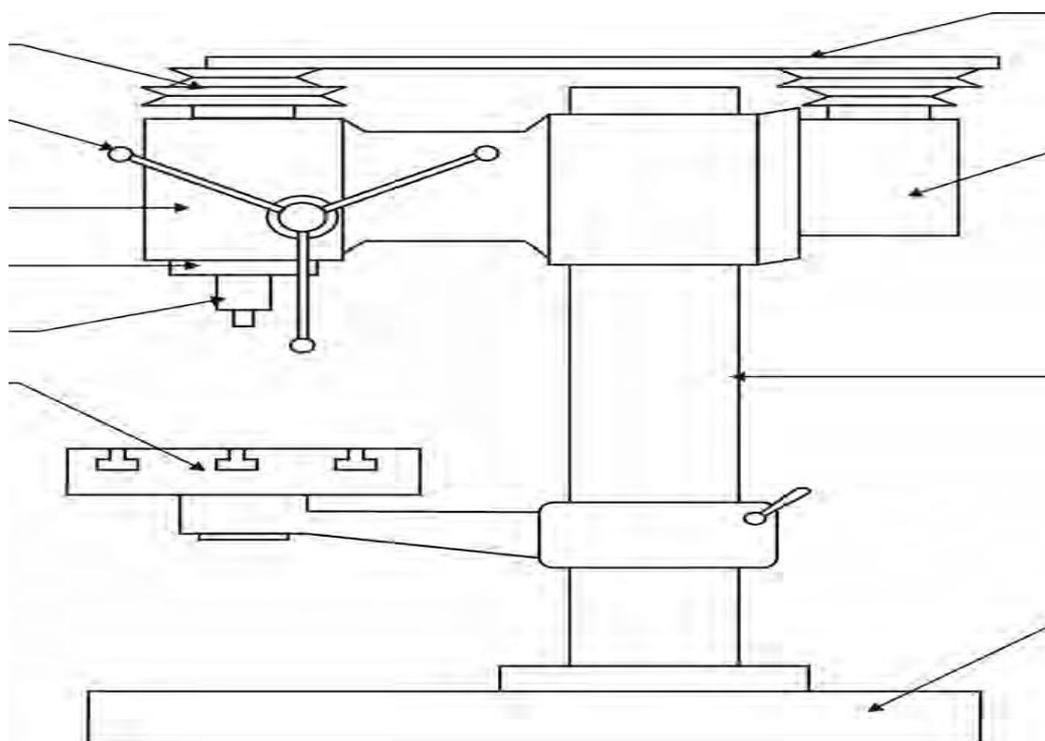
**Table**

The table is mounted on the vertical column and can be adjusted up and down on it. The table has 'T'-slots on it for holding the work pieces or to hold any other work holding device. The table can be adjusted vertically to accommodate work pieces of different heights and can be clamped at the required position.

**Drill head**

Drill head is mounted on the top side of the column. The drill spindle and the driving Motor are connected by means of a V-belt and cone pulleys. The motion is transmitted to The spindle from the motor by the belt. The pinion attached to the handle meshes with the Rack on the sleeve of the spindle for providing the drill the required down feed. There is no Power feed arrangement in this machine. The spindle rotates at a speed ranging from 50 to

2000 r.p.m.



- |               |                 |          |
|---------------|-----------------|----------|
| 1. Base       | 2. Column       |          |
| 3. Electric   | 4. motor        |          |
| 5. 'V' belt   | 6. Table        |          |
| 7. Spindle    | 8. Sleeve       |          |
| 9. Drill head | 10. Feed handle | 11. Step |

#### 4. Explain any two drill holding devices.

The drill spindle is suitable for holding only one size of tool shank. If the shank of the Tool is smaller than the taper in the spindle hole, a taper sleeve is used. The outside taper of the sleeve conforms to the spindle taper and the inside taper holds the shanks of the smaller size tools. The sleeve has a flattened end or tang which fits into the slot of the spindle.

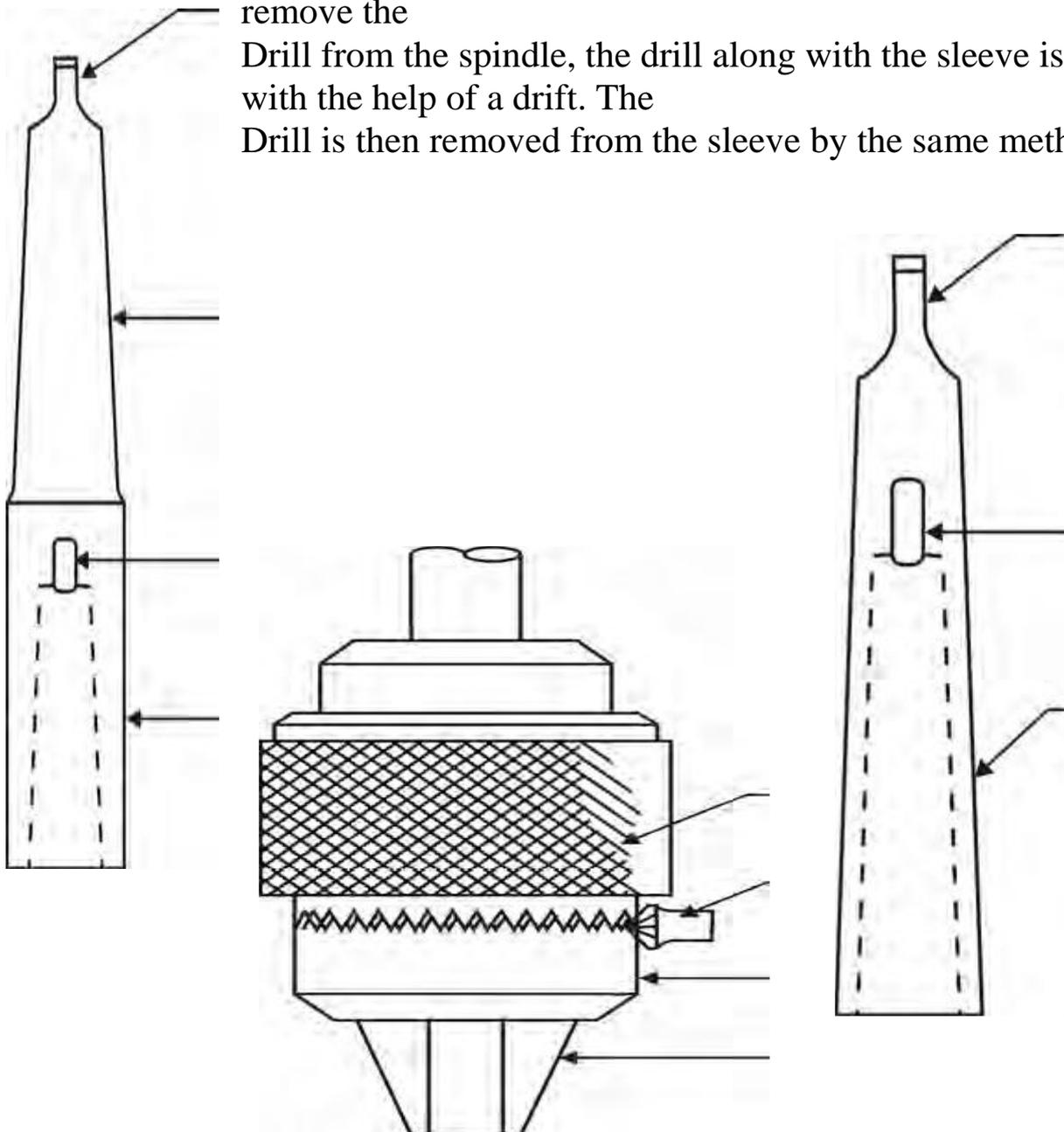
The tang of the tool fits into a slot provided at the end of the taper hole of the sleeve. Different

Sizes of tool shanks may be held by using different sizes of sleeve. In order to

remove the

Drill from the spindle, the drill along with the sleeve is removed with the help of a drift. The

Drill is then removed from the sleeve by the same method.



SLEEVE

CHUCK

SLEEVE

**CHUCK:**

This type of chuck is particularly adapted for holding tools having straight shanks. Drill chuck has a taper shank which fits into the taper hole of the spindle. The jaws fitted in the body of the chuck holds the straight shank drills.

**3. Name the milling cutters.**

1. Plain milling cutter
2. Side milling cutter
3. Metal slitting saw
4. Angle milling cutter
5. End milling cutter
6. 'T' – Slot milling cutter
7. Fly cutter
8. Formed cutter

**2. List out various milling machine attachments.**

The milling machine attachments are intended for the purpose of developing the range of operations, versatility, production capacity and accuracy of machining process.

The different milling machine attachments are:

- 1) Vertical milling attachment
- 2) Universal milling attachment
- 3) High speed milling attachment
- 4) Slotting attachment
- 5) Rotary table attachment
- 6) Indexing head attachment

**4. What are the different milling machine operations?**

1. Plain milling
2. Face milling
3. Side milling
4. Straddle milling
5. Angular milling
6. Gang milling
7. Form milling
8. End milling
9. Flute milling
10. Keyway milling
11. Drilling & reaming
12. Boring
13. Gear cutting
14. Thread milling
15. Cam milling

**1. What are the differences between a plain milling machine and a universal milling machine?**

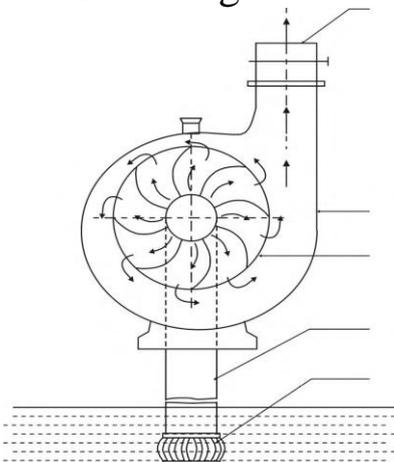
Plain milling machine	Universal milling machine
<ol style="list-style-type: none"> <li>1. The table can be moved vertically, longitudinally and crosswise.</li> <li>2 Helical milling works cannot be done as the table cannot be swiveled.</li> <li>3. As there are no special attachments, operations like gear cutting, slotting and Vertical milling cannot be performed.</li> <li>4. It is more rigid and suitable for machining on heavy and large workpieces and for simple milling operations.</li> <li>5. The cost is less.</li> </ol>	<ol style="list-style-type: none"> <li>1. Apart from the three movements of a plain milling machine, it can be swiveled about 45°.</li> <li>2. The table can be swiveled and helical milling and spiral milling can be performed.</li> <li>3. Special attachments like indexing head, rotary table, vertical milling attachment, slotting head are available With this machine. So spur gear, helical gear, bevel gear, cutters and reamers can be machined.</li> <li>4. It is meant for light work pieces. A wide range of operations can be performed in this machine. It is mainly used in tool rooms.</li> <li>5. It is very costly.</li> </ol>

**1. List out the differences between a centrifugal pump and a reciprocating pump.**

Centrifugal pump	Reciprocating pump
<ol style="list-style-type: none"> <li>1. Handles high volumes of liquid.</li> <li>2. Practically handles all types of liquid - Oil, sewage, chemicals, paper pulp, jiggery and liquids of high viscosity.</li> <li>3. Rotates at higher speeds</li> <li>4. Not provided with suction valve and delivery valve.</li> <li>5. The discharge of liquid is continuous.</li> <li>6. Less maintenance cost</li> <li>7. Less weight.</li> <li>8. Occupies less space.</li> <li>9. Consists of few simple parts.</li> <li>10. The efficiency is low.</li> </ol>	<ol style="list-style-type: none"> <li>1. Handles less volumes of liquid.</li> <li>2. Used for pumping pure liquids and liquids with low viscosity</li> <li>3. Moves at a slow speed.</li> <li>4. Provided with suction valve and delivery valve</li> <li>5. The discharge is pulsating.</li> <li>6. High maintenance cost.</li> <li>7. The weight is relatively high.</li> <li>8. Requires more space.</li> <li>9. Complicated parts.</li> <li>10. The efficiency is high.</li> </ol>

**2. Explain the parts of a centrifugal pump with a diagram.**

- |                |                 |                  |
|----------------|-----------------|------------------|
| 1. Prime mover | 2. Impeller     |                  |
| 3. Casing      | 4. Suction pipe | 5. Delivery pipe |



**Prime mover**

The prime mover of a pump shall be an electric motor or an oil engine. It provides the

Rotational power to the shaft of the device.

**Impeller**

It is the rotating part of the device. Vanes or blades are arranged in series on it. The vanes are fitted on the shaft and rotated by the prime mover.

**Casing**

Casing is a hollow chamber surrounding the impeller. It is made as an air-tight unit. The sectional area of the casing gradually increases in the direction of the flow of liquid. This construction ensures the decrease in the velocity of the liquid and increase of the pressure.

**3. Explain the parts of a reciprocating pump with a diagram.**

- |                   |                   |
|-------------------|-------------------|
| 1. Cylinder       | 2. Piston         |
| 3. Connecting rod | 4. Crank          |
| 5. Suction pipe   | 6. Suction valve  |
| 7. Delivery pipe  | 8. Delivery valve |

**Cylinder**

Cylinder is a hollow part inside of which is accurately machined. Piston reciprocates

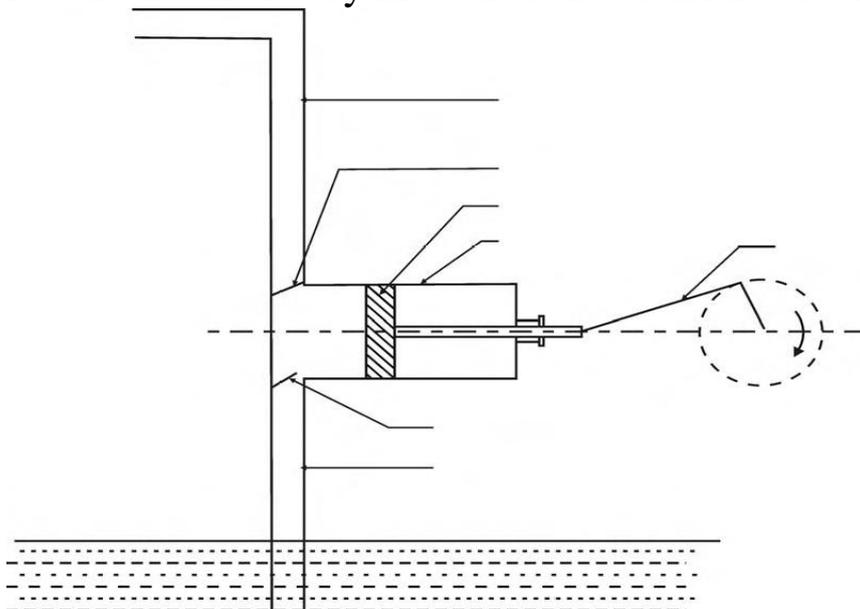
Within the cylinder.

**Piston**

Piston is the reciprocating part of the pump. A connecting rod is connected to it on one side.

**Connecting rod**

Connecting rod is attached to piston on one end and with a crank on the other end. It converts the rotary motion of the crank into reciprocating motion of the piston.

**Working of a reciprocating pump**

When the crank is made to rotate by means of prime mover, the piston reciprocates

Within the cylinder to pump out the liquid.

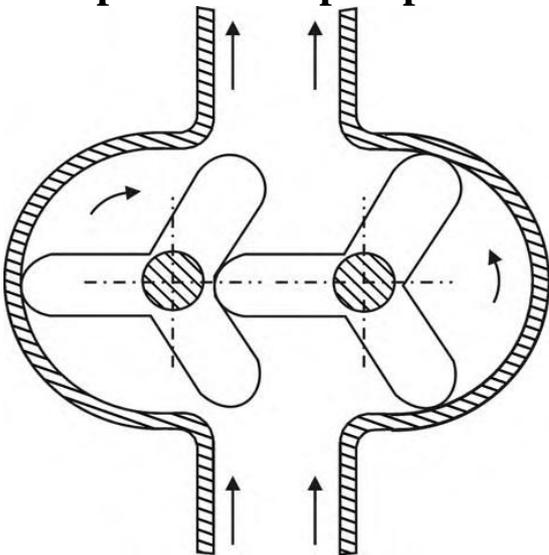
### Suction stroke

When the piston starts moving towards right, a vacuum is created on the left of the cylinder. The suction valve opens and the liquid is sucked through the suction pipe into the cylinder. The delivery valve remains closed at this stage.

### Delivery stroke

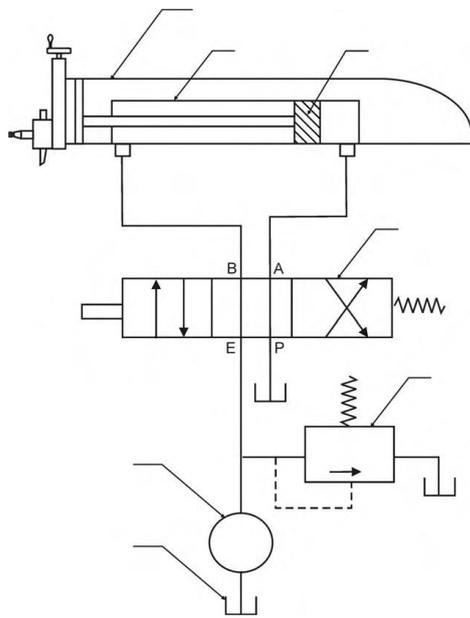
Due to the rotation of the crank, piston is moved towards left. The piston exerts Pressure on the liquid inside the cylinder and the delivery valve opens. The liquid is thrown through the delivery pipe with pressure. At this stage, the suction valve remains closed. On continuous reciprocation of the piston, liquid is sucked and pumped continuously.

### 4. Explain a lobe pump with a diagram.



- i) In a lobe pump, two lobes are placed inside a casing and are made to rotate to pump out . Liquid.
- ii) The case of the pump is made of cast iron.
- iii) Both the lobes get rotational power separately to rotate at same speed.
- iv) Both the shafts will be extending outside to receive power.
- v) They are secured properly in the case with proper packing to avoid leakage of oil.
- vi) The pump is provided with an inlet and an outlet.
- vii) The gap between the lobes and the case is minimum and so the oil is pumped through Form of liquid.

### 5. Draw the circuit of a hydraulic shaper and label its parts.

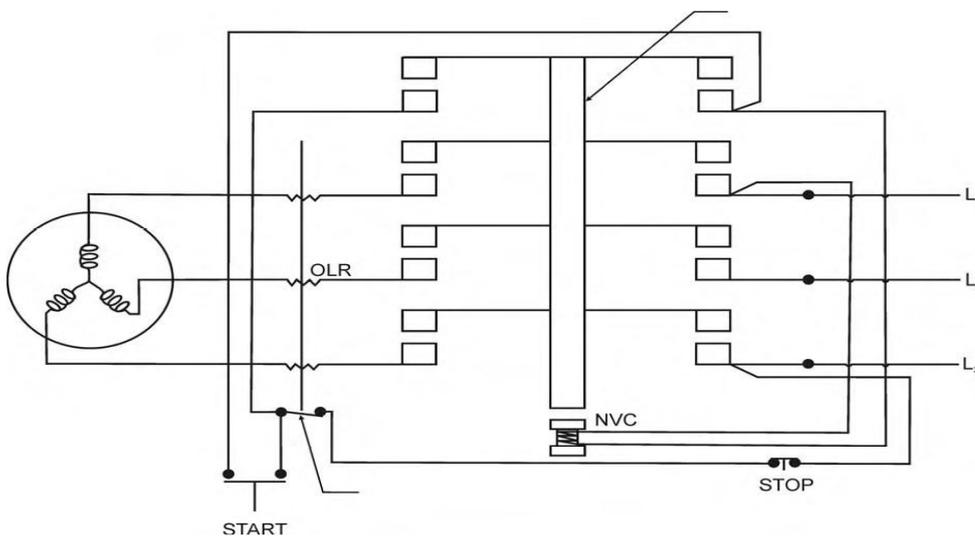


### 1. Differentiate a squirrel cage induction motor from a slip ring induction motor.

Squirrel cage induction motor	Slip ring induction motor
<ol style="list-style-type: none"> <li>1. Simple in construction</li> <li>2. Low cost</li> <li>3. Operates at high efficiency</li> <li>4. There is no chance of sparks and hence it is explosion proof</li> <li>5. Requires the least maintenance</li> <li>6. Starting arrangements are simple</li> <li>7. Starting torque is less</li> <li>8. Speed control is not easily possible</li> </ol>	<ol style="list-style-type: none"> <li>1. Construction is complicated because rotor is also wound with insulated wire</li> <li>2. The cost is high</li> <li>3. Efficiency is not high</li> <li>4. Sparking risk is there because of slip-rings and the brushes riding on them</li> <li>5. Maintenance is troublesome</li> <li>6. Requires costly starters</li> <li>7. High starting torque</li> <li>8. Speed can be changed eerily</li> </ol>

### 2. Draw and explain a D.O.L starter.

- I) It is simple in construction when compared with other starters.
- ii) It permits the motor to startup with full voltage on.
- iii) It has protective elements to safeguard the motors against over loading and single phasing.
- IV) Single-phasing means operation of motor with one line cut of accidentally.
- v) When the start button is pressed, the no volt coil energizes.
- vi) The contacts are pressed against spring tension to connect the motor terminals to three-phase supply. The motor starts running.



vii) Pressing of 'start' button is stopped, the circuit is closed through the fourth conductor and the motor continues to run.

viii) Motor is overloaded, the temperature of the heating elements becomes high to heat the bimetallic strip.

ix) Over load relay (OLR) to press a lever to open the no volt coil for a moment to switch off the supply to stop the motor.

x) If the OFF button is pressed, the supply to the No volt coil is disconnected and the motor is stopped. Direct-on-line starters are used for motors with capacity up to 5 hp.

### 3. Draw a neat diagram of a star - delta starter and explain.

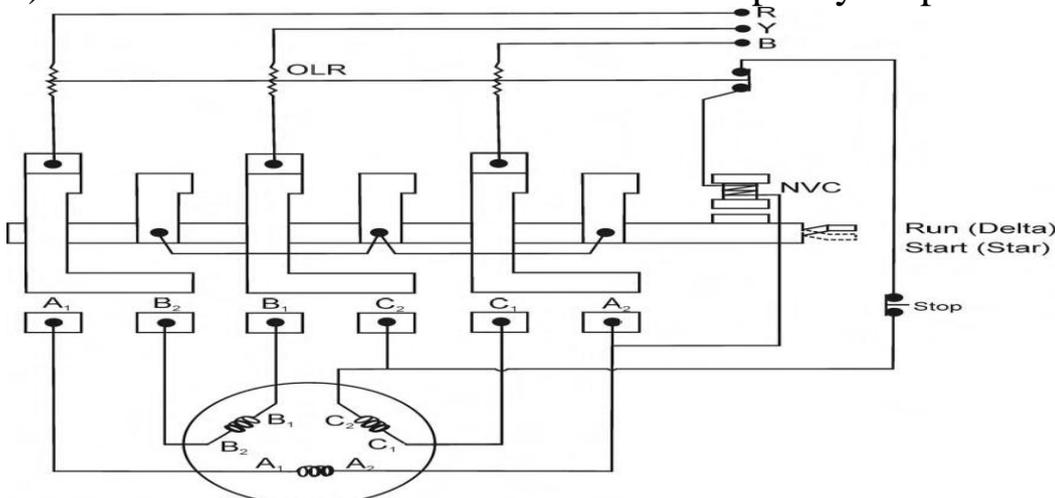
i) This starter has two positions – 'start' and 'run'. When the handle is pressed to 'start', the three motor windings are connected in star formation.

ii) Each phase winding gets only 58% of the line voltage. So the starting line current to the motor is reduced. As the motor picks up speed and attains nearly 80% of normal r.p.m. the starter handle is pushed to 'run' position.

iii) In this run position, the three winding get connected in delta formation so that each winding gets full supply voltage and full line current.

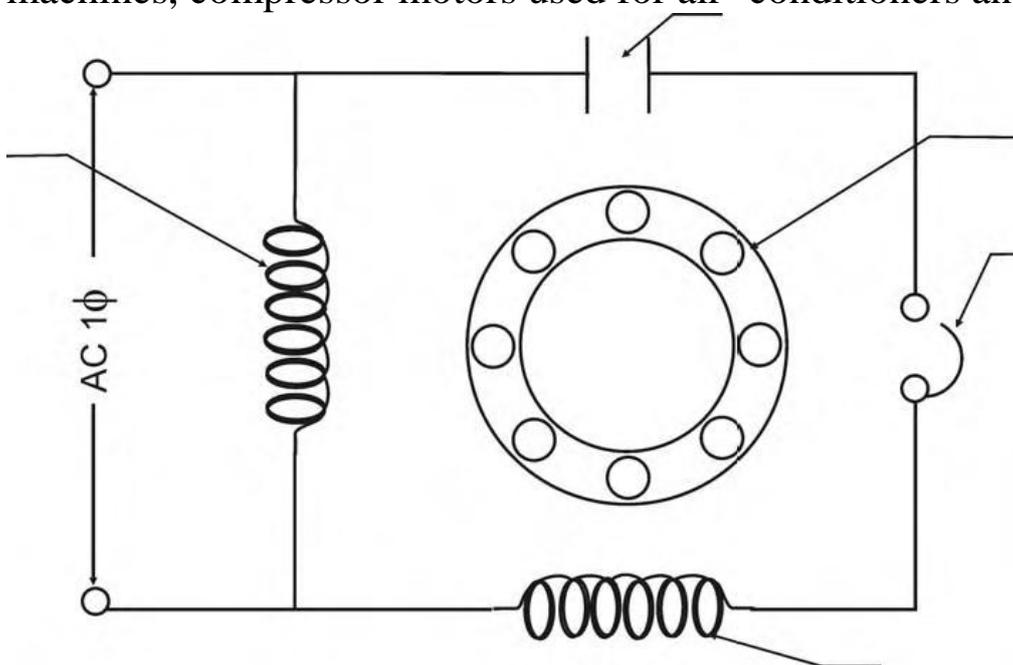
iv) This starter is provided with usual protective devices such as overload relay, no volt release and single phase preventer.

v) Star-delta starter is used for motors of capacity 5 hp to 15Hp

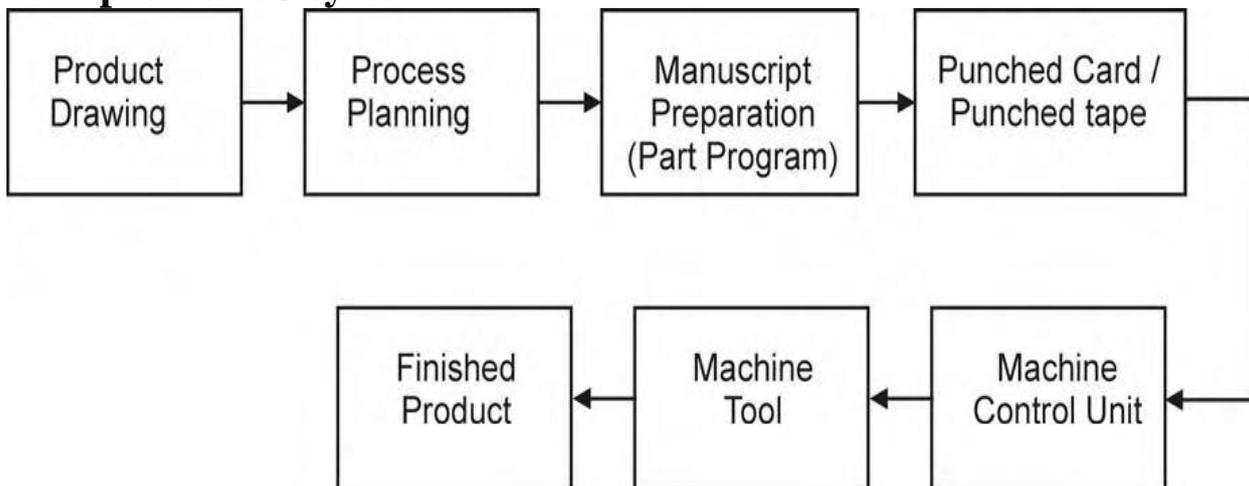


#### 4. Draw and explain A.C. single phase capacitor start motor. [www.Padasalai.Net](http://www.Padasalai.Net)

- i) The stator of A.C single phase capacitor start motor has two windings - running Winding & starting winding.
- ii) A capacitor and a centrifugal switch are connected in series with the starting winding. A squirrel cage rotor is fitted in this motor. Capacitor creates  $90^\circ$  phase difference between the two windings.
- iii) Single phase current is supplied and the development of rotating magnetic field makes the rotor to rotate.
- iv) When the rotor attains 70% of the total speed, the centrifugal switch disconnects the starting winding. This motor has high starting torque.
- v) The direction of rotation can be changed by just changing the connection of terminals of any one of the windings.
- iv) The motors find extensive use in wet grinders, small grinding machines, drilling machines, compressor motors used for air -conditioners and refrigerators.



#### 1. Explain a NC system.



- i) As explained in the previous section, the NC system requires the preparation of manuscript (part program) based on the product drawing, preparation of input

media (punched cards & punched tapes), the data entry into the control unit, consequent processing and actuation of the machine tool to produce the desired part.

ii) In performing all the above operations, the NC machine may have the following elements:

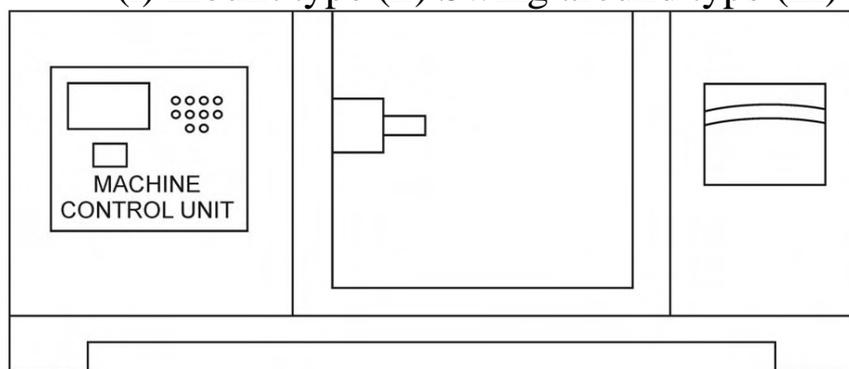
1. Software
2. Machine Control Unit
3. Driving devices
4. Manual control unit
5. Machine tool

### 3. What is MCU? Explain its types?

Machine Control Unit consists of electronic circuits (hardware) that are useful in reading and interpreting the instructions (NC program) fed by means of input media and convert them into mechanical actions of the machine tool.

MCU three types

(i) Inbuilt type (ii) Swing around type (iii) Standalone type

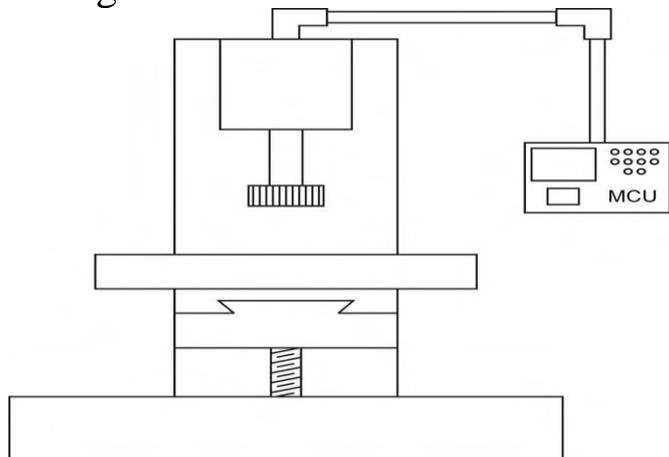


#### **Inbuilt MCU**

When the control unit of the NC machine is housed in the construction of the machine itself, it is known as Inbuilt MCU.

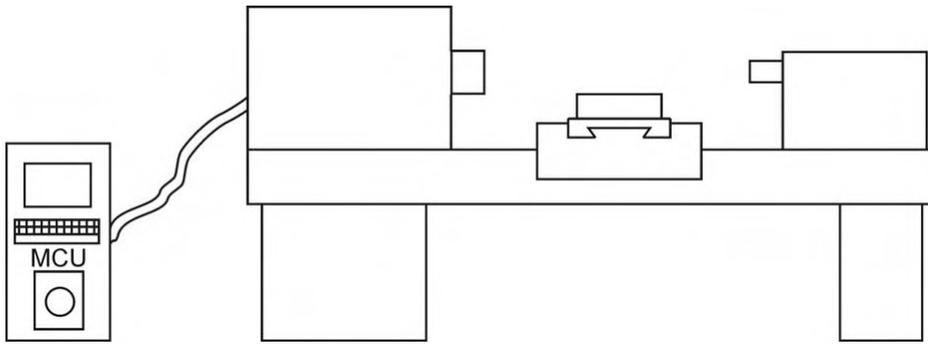
#### **Swing around MCU**

This MCU is a separate unit and is connected to the machine by a swinging arrangement. The unit as a whole can be swung around the machine the



#### **Standalone MCU**

Standalone MCU is designed as a separate unit and placed at a distance from the machine.



#### 4. Explain driving devices of a NC system?

i) Driving devices consist of different types of motors and gear trains. They convert the instructions from the MCU into accurate mechanical displacements of the machine tool slides. ii) The motors may be electrical, hydraulic or pneumatic. Electrical motors are mainly used as prime movers because of their speed and torque characteristics.

iii) A.C. induction motors are cheap and easy to maintain. For easy and Effective speed changes, D.C. motors are also used.

iv) Hydraulic motors are used in some specific types of CNC machines. Hydraulic motors get the drive from oil pumped from a constant delivery hydraulic pump.

v) Hydraulic motors are used where the load is high and wider range of speed is necessary.

vi) Servomotor, stepper motor, synchs and resolvers are different types of motors used as drives in NC machines.

#### 5. Explain the types of feedback system?

i) The instructions are picked from the punched card or tape by the reading Unit.

ii) Processors send electric pulses which actuate the motors and slides to govern the movement of the spindle or tables.

iii) A control system is necessary to check the actual output movement with the desired value as given in the input. This system is known as feedback system.

**Open loop System:** When a NC system does not have any feedback arrangement, it is known as open Loop system. Actual output movement is not directly measured and checked with the desired Movement.

**Closed loop system:** i) In this system, the final movements (spindle speed and slide displacement) are compared and balanced with the values given through the input commands.

ii) The movements of spindle and slides are measured by feedback devices like velocity transducers and position transducers and sent back to control unit for comparing.

iii) If the feedback values does not match with the input values, the difference is corrected

iv) This system is adopted where highest positional accuracy is required.

## 6. Briefly explain the advancements in NC machines.

1. Direct Numerical Control (DNC)
2. Adaptive Control (AC)

Explain:

1) A manufacturing system in which several NC machines are connected to and Controlled by a remotely located main frame computer, is known as Direct Numerical Control.

2) The basic constituents of the system are (i) Main frame computer (ii) Bulk memory (iii) Network system and (IV) NC machine tools.

Advantages:

DNC system eliminates the need of separate machine control units, input media like Punched card and tapes. This system looks after the scheduling of work of all the NC Machine tools. The required network system may be a LAN (Local Area Network) or a WAN (Wide Area Network).

### 9.9.2 Adaptive Control

Explain:

Adaptive control is a system in which an important feature of decision making is Employed during machining. When a component is being manufactured, some important

Process variables like torque, force and temperature are measured. These values are Compared with established limits

Advantages:

The adjustment of cutting speed, feed and depth of cut. This system enables cost effective, quality and high rate of production.

#### 1. What are the objectives of lubrication?

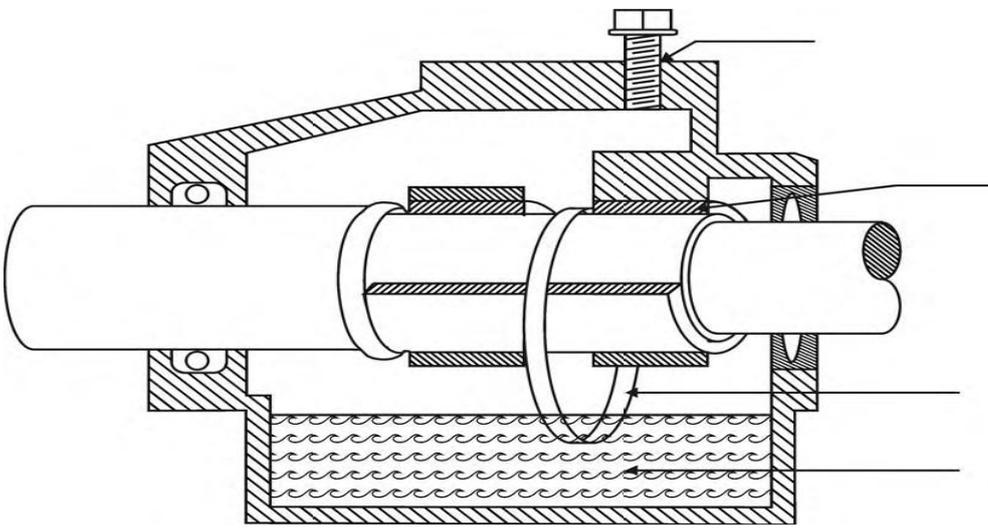
1. Smooth functioning of sliding and moving parts
2. To reduce friction and consequent wear
3. To remove burrs and dust
4. To reduce the heat generated due to friction
5. To prevent rust formation on precise parts
6. To provide cushioning effect to the load shocks
7. for hydraulic circuits to transmit power

#### 2. Explain 'Ring lubrication' with a diagram.

i)The method of ring lubrication involves a ring hanging from down the rotating shaft.

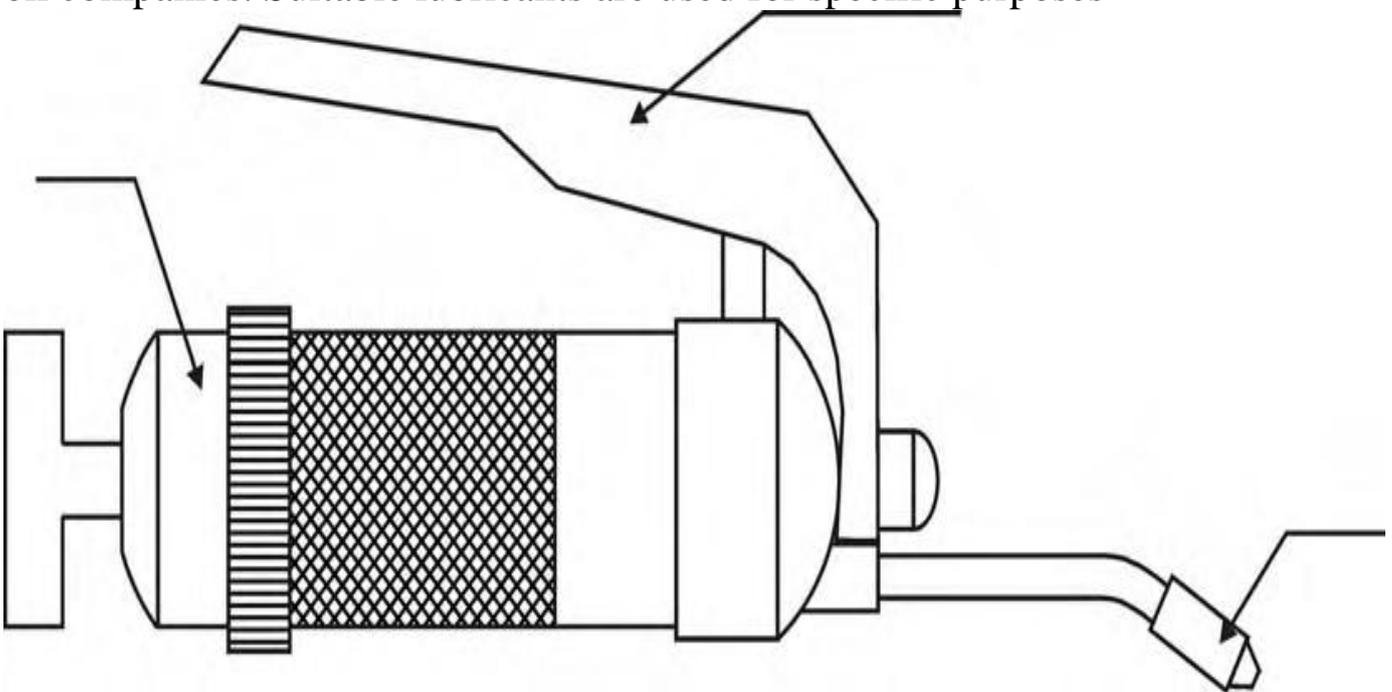
ii)The bottom portion of the ring is immersed in the oil container. When the shaft starts Rotating, the ring also rotates. While the ring rotates, it carries a small amount of oil and the

Oil is spread into the bearing and the shaft.



#### 4. 'Grease lubrication' - Explain.

Grease lubrication is done with the help of grease guns. Another way of doing it simply is to fill a container with grease and the container is connected to the parts to be lubricated by means of a small tube. When a screw is screwed into the container, a good amount of grease is taken to the required place. Lubricating oil and grease are manufactured under several trade names by the Indian oil companies. Suitable lubricants are used for specific purposes



#### 5. Explain 'Routine maintenance'.

Routine maintenance is done to avoid unnecessary breakdown of machine tools. It involves regular works like cleaning and lubricating, making minor adjustments and doing small repair works.

It is important to chart out what are all to be done daily, weekly and monthly.

## **Daily maintenance**

1. Cleaning all the parts of the machine tool
2. Lubricating the movable parts with grease and oil as per requirements
3. To correct the machine tool to make it operate accurately
4. To look at whether the coolant supply and auto lubricating equipments are working properly
5. To remove the burrs cleanly

## **Weekly maintenance**

1. The measuring instruments, gauges and hand tools are checked and corrected if necessary.
2. The spare parts and integral parts of the machine tools should be cleaned.
3. The entire workshop premises should be maintained cleanly.
4. Grinding wheels of bench grinders and tool and cutter grinders should be dressed. The work rests of these machines should be adjusted properly.
5. The protective devices in the machine tool are checked whether they are properly fixed. And they are corrected if necessary.
6. The cables and electrical connections should be checked.
7. The position and working of belt, chain etc., are checked and adjusted.
8. Parts like gears, clutches and bearings are checked for their proper functioning.
9. The accuracy of precision measuring instruments are checked and corrected. They are also checked for zero error.

## **6. Explain 'Planned maintenance programme'.**

1. When a new machine tool arrives to the machine shop or the existing machine tools are to be replaced, it is required to install the machine tools properly, level and align them correctly and connect them to the electrical terminals safely.
2. If errors are found in the dimensional accuracy, the errors should be recorded and analysed whether the machine is in bad condition.
3. It is necessary to plan and get ready the materials, spares and tools required for the maintenance in advance so that the maintenance work is carried out in time.
4. The operators and supervisors should know the importance of the cutting speed, feed data of the machine tools.
5. Emergency repair works should be done without any delay in the case of breakdown of any of the machine tools.

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