

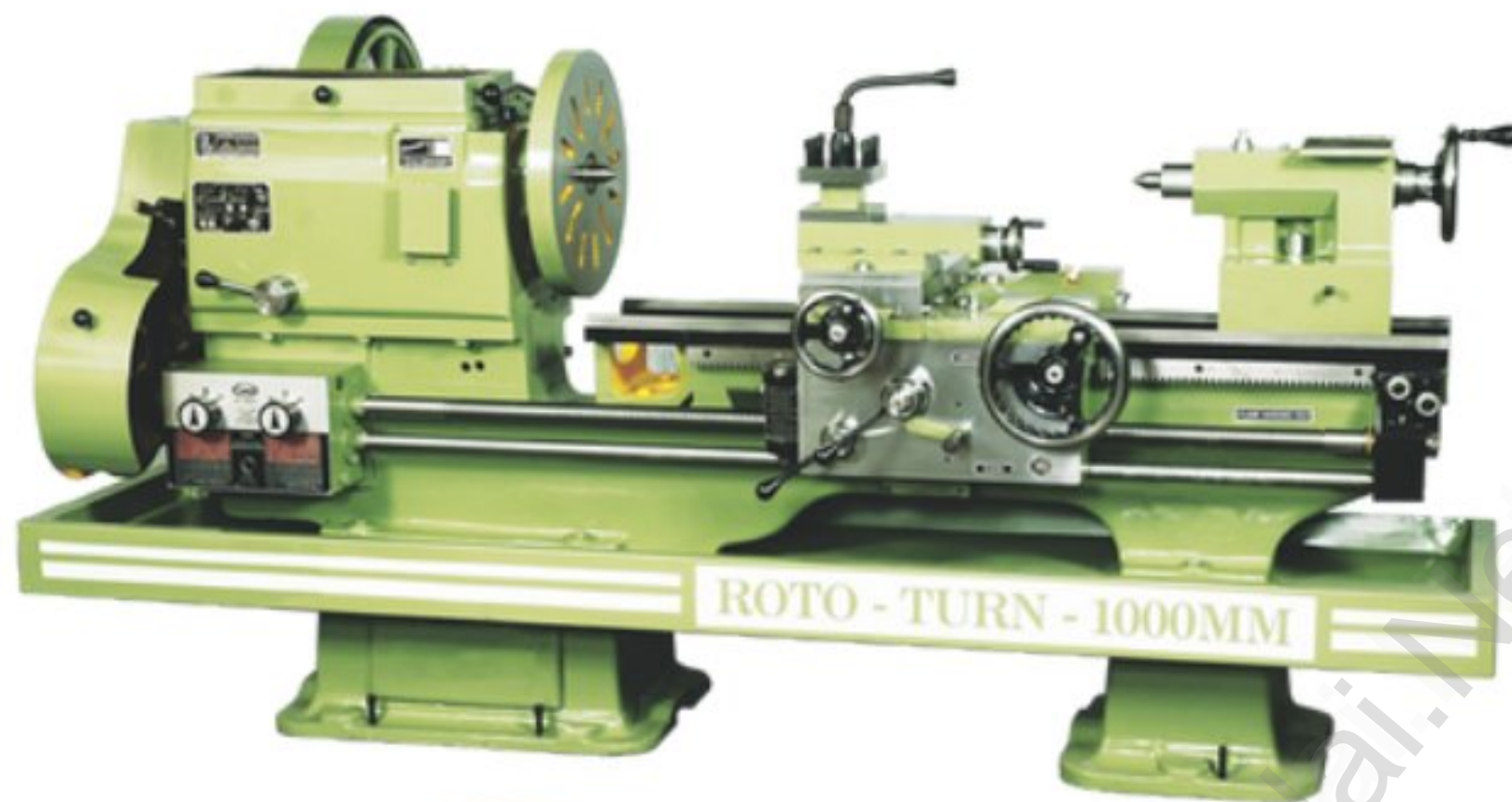


BASIC MECHANICAL ENGINEERING



12

BME



Salient Features :

- Based on New syllabus
- Based on Govt. Key
- For All Chapters extra questions are given.

XII

BASIC MECHANICAL ENGINEERING

CONTENT

L.NO	CHAPTER	PAGE NO
1	LATHE	3 - 11
2	DRILLING MACHINE	12 - 21
3	SHAPING MACHINE	22 - 27
4	GRINDING MACHINE	28 - 34
5	MILLING MACHINE	35 - 41
6	MACHINE TOOL MAINTENANCE	42 - 48
7	WELDING	49 - 56
8	CNC	57 - 61
9	AUTOMATION AND ROBOTICS	62 - 65
10	INDUSTRIAL MANAGEMENT	66 - 72
11	BOOK INSIDE QUESTIONS WITH ANSWER	73 - 86



1. LATHE

ONE MARK

CHOOSE THE CORRECT OPTION:

- The inventor of lathe is _____
 - Henry Maudslay**
 - Eli Whitney
 - James Nasmyth
 - Arthur James Arnot
- The assembly which consists of saddle, cross-slide, compound slide and tool post is _____
 - head stock
 - tailstock
 - bed
 - carriage**
- The bed of the lathe is made of a _____
 - Cast Iron**
 - High carbon Steel
 - High speed steel
 - Stellite
- _____ is used for changing the direction of rotation of the lead screw
 - Tumbler gear**
 - Back gear
 - Gear box
 - Stepped Cone Pulley
- A part used in taper turning is _____
 - cross slide
 - compound rest**
 - saddle
 - apron
- The formula for finding the cutting speed in a lathe is
 - $\frac{\pi d n}{1000}$**
 - $\frac{d_1 - d_2}{2l}$
 - $\pi r^2 h$
 - $\frac{D-d}{2} \times \frac{L}{l}$
- Polishing lathe is a type of _____
 - Engine Lathe
 - Tool room Lathe
 - High speed Lathe**
 - Automatic Lathe
- Turret and capstan lathes are classified under _____
 - automatic lathes
 - semi-automatic lathe**
 - bench lathe
 - tool room lathe
- The spindle speed of high speed lathe is around _____
 - 6000-1000rpm
 - 1200-3200rpm**
 - 2000-2400rpm
 - 3500-4000rpm
- The tool used in lathe is a _____
 - Multipoint cutting tool
 - Single point cutting tool**
 - Slitting saw tooth cutting tool
 - Parting tool

3 MARKS

1. What is meant by lathe?

It is considered as one of the oldest machine tools and is widely used in industries. It is called as mother of machine tools.

2. What is turning?

Turning is a process of removing excess material from a work piece to produce a cylindrical surface by using a turning tool.

3. What are the uses of tool room lathe?

This is mainly used for precision works like manufacturing tools, dies, jigs, fixtures and gauges.

4. What is swing diameter?

It is the largest diameter of the work piece that will be rotate without touching the lathe bed. It is twice the height of the center measured from lathe bed

5. What are the special features of V-bed in a lathe?

It provides better guideways for the carriage and tailstock. During machining metal chips fall automatically on the tray.

6. What are the uses of back gear in a lathe?

It is used to reduce the spindle speed when turning large diameter of the work and cutting coarse thread. Eight different types of spindle speed can be obtained by this mechanism.

7. What is the use of Lead screw in a lathe?

Lead screw is used to move the carriage automatically towards or away from the headstock while thread cutting It also used to lock the carriage at desired position.

8. Mention the use of magnetic chuck.

Work piece made of magnetic materials are held in this chuck. Light and thin work pieces are held in this chuck.

9. Mention the formula for cutting a thread in a lathe.

$$\frac{\text{TPI on leadscrew}}{\text{TPI on work}} = \frac{\text{driver teeth}}{\text{driven teeth}}$$

10. Pitch of the lead screw is 4TPI. The pitch of the thread to be cut on the work piece is 6TPI. Find the change gear.

$$\frac{\text{TPI on leadscrew}}{\text{TPI on work}} = \frac{\text{driver teeth}}{\text{driven teeth}}$$

$$= 4/6 = (4 \times 10)/(6 \times 10) = 40/60$$

The driver gear in head stock spindle is 40 teeth. The driven gear in lead screw is 60 teeth.

11. Define cutting speed in lathe?

The cutting speed is the distance travelled by a point on the outer surface of the work in one minute.

$$\text{Cutting speed} = \frac{\pi DN}{1000} \text{ m/min.}$$

5 MARKS

1. List out the types of lathe

1. Engine lathe or Centre lathe
2. Speed lathe
 - a. Centering lathe
 - b. Wood working lathe
 - c. Polishing lathe
 - d. Metal spinning 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

2. Mention any five differences between a turret and a capstan lathe.

Turret lathe	Capstan lathe
1. Turret tool head is directly fitted on the saddle and both of them appear like one unit	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	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.	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 workpieces	As the movement of the ram is limited, it is suitable for machining shorter workpieces only.

5. To index the turret tool head, a clamping lever is released and the turret is rotated manually.	When the handwheel for the ram is reversed, the turret tool head is indexed automatically.
6. Limit dogs are used to control the distance of tool movement	To control the distance of tool movement, feed stop screws are provided at the rear side of the turret.
7. Suitable for machining heavy and large workpieces.	Only small and light work pieces are machined
8. Machining can be done by providing more depth of cut and feed.	Only limited amount of feed and depth of cut are provided for machining.

3. What are the parts in the carriage of a lathe?

The parts of the carriage are

- a. Saddle
- b. Cross slide
- c. Compound rest
- d. Compound slide
- e. Tool post
- f. Apron

Saddle

Saddle connects the front and back portion of bed guideways like a bridge.

It is an 'H' shaped casting. It moves along the bed between headstock and tailstock. The saddle can be moved by providing hand feed or automatic feed.

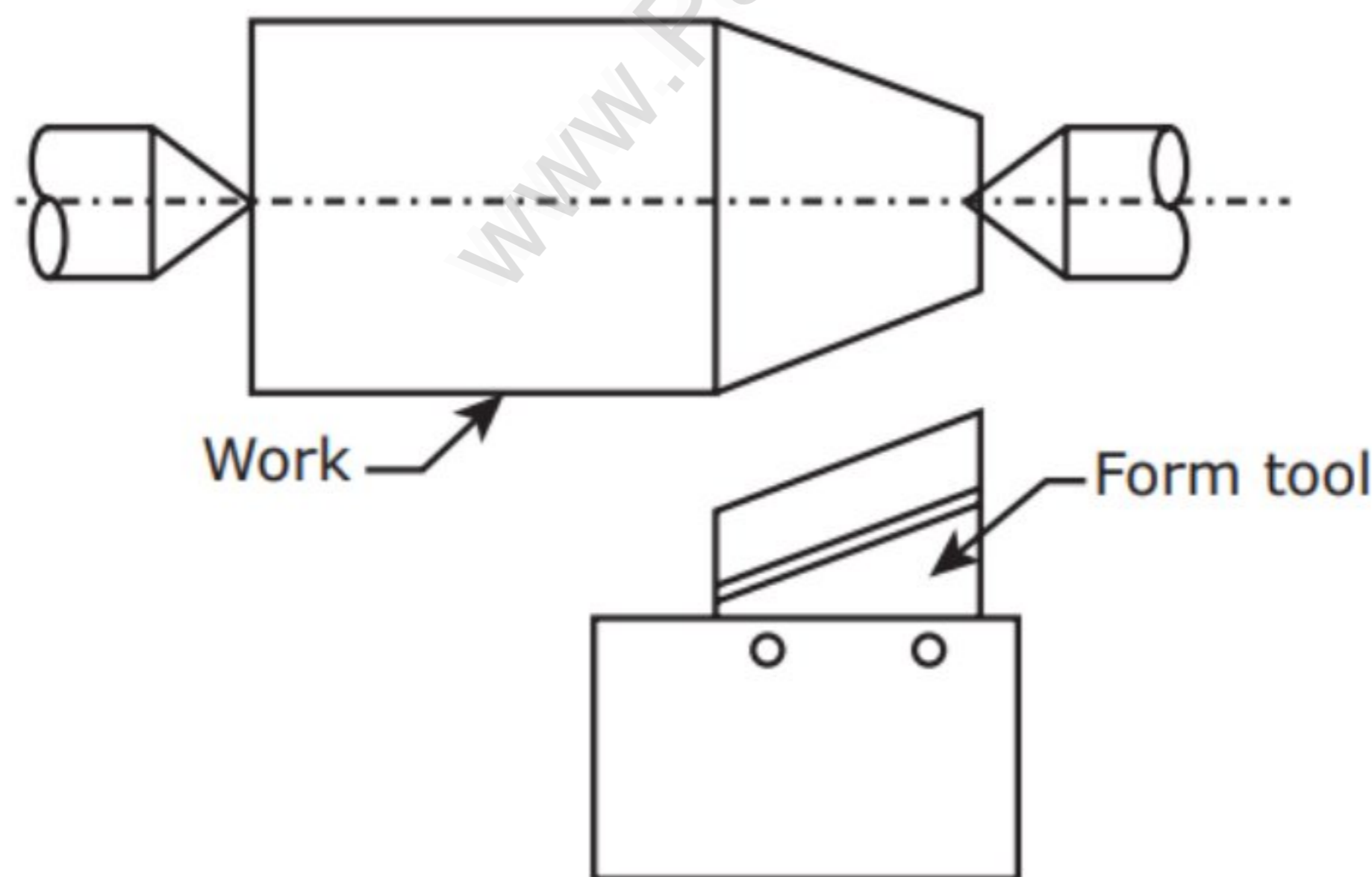
4. Mention any of the specifications of a lathe.

1. The length of the bed.
2. Maximum distance between live and dead centres.
3. The height of centres from the bed.
4. The swing diameter
 - a. The swing diameter over bed – It refers to the largest diameter of the work that will be rotated without touching the bed.

- b. The swing diameter over carriage – It refers to 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

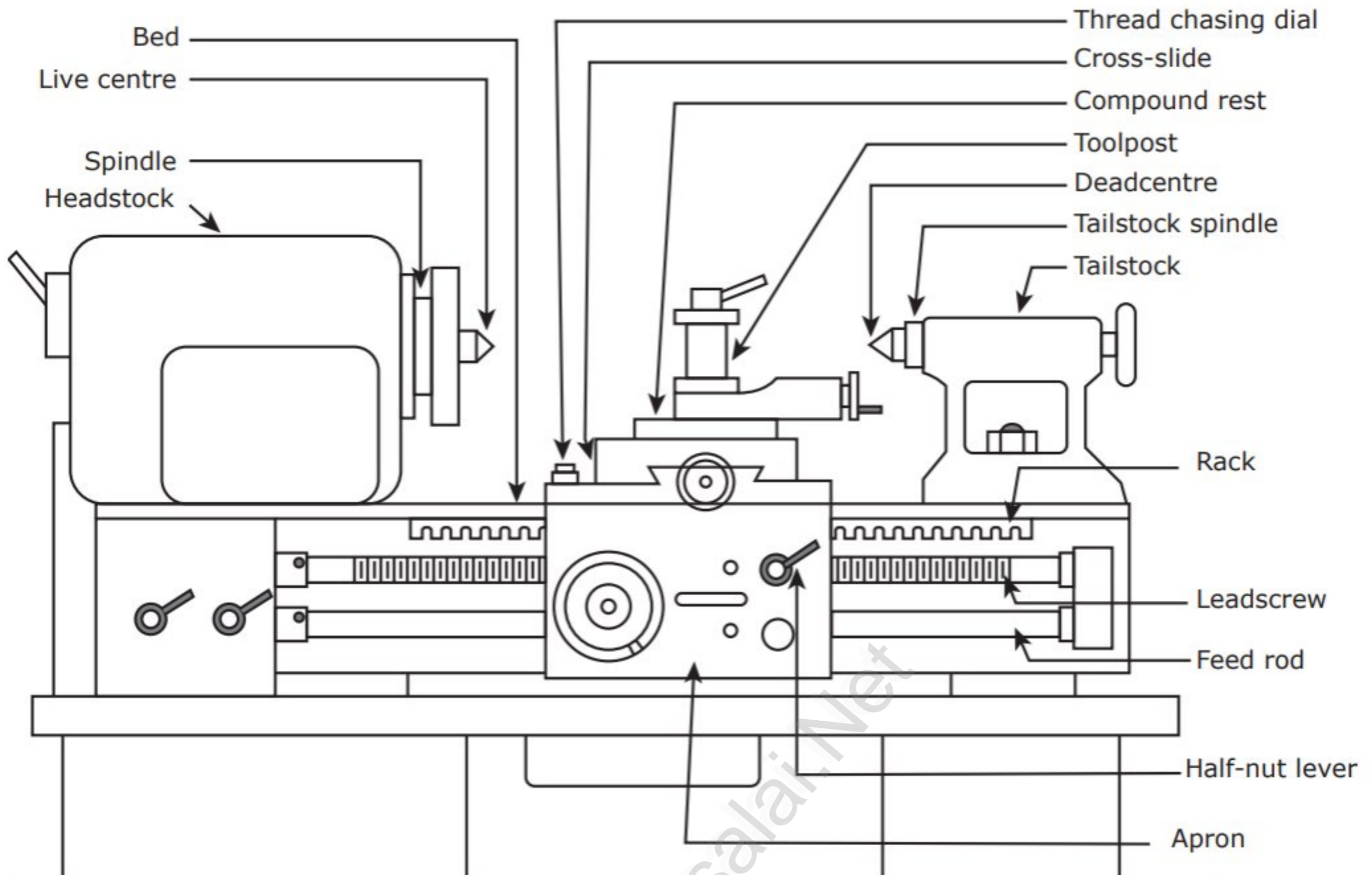
5. Sketch and explain the taper-turning by using the form-tool method.

A broad nose tool is grinded to the required length and angle. It is set on the tool post and providing feed to the crossslide. When the tool is fed into the work at right angles to the lathe axis, a tapered surface is generated. This method is limited to turn short lengths of taper only. The length of the taper is shorter than the length of the cutting edge. Less feed is given as the entire cutting edge will be in contact with the work.



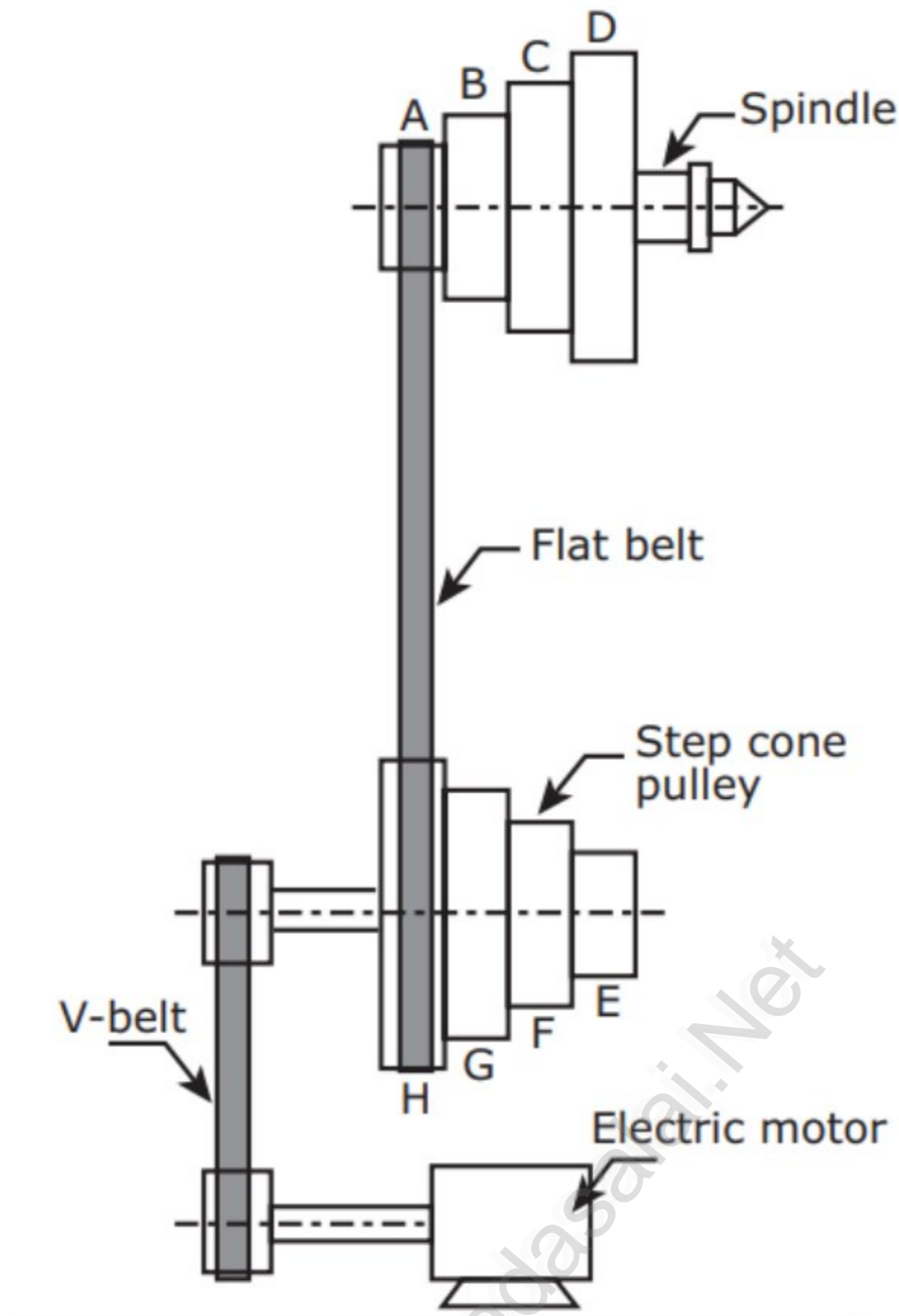
10 MARK

1. Draw a neat sketch of a lathe and label its parts.

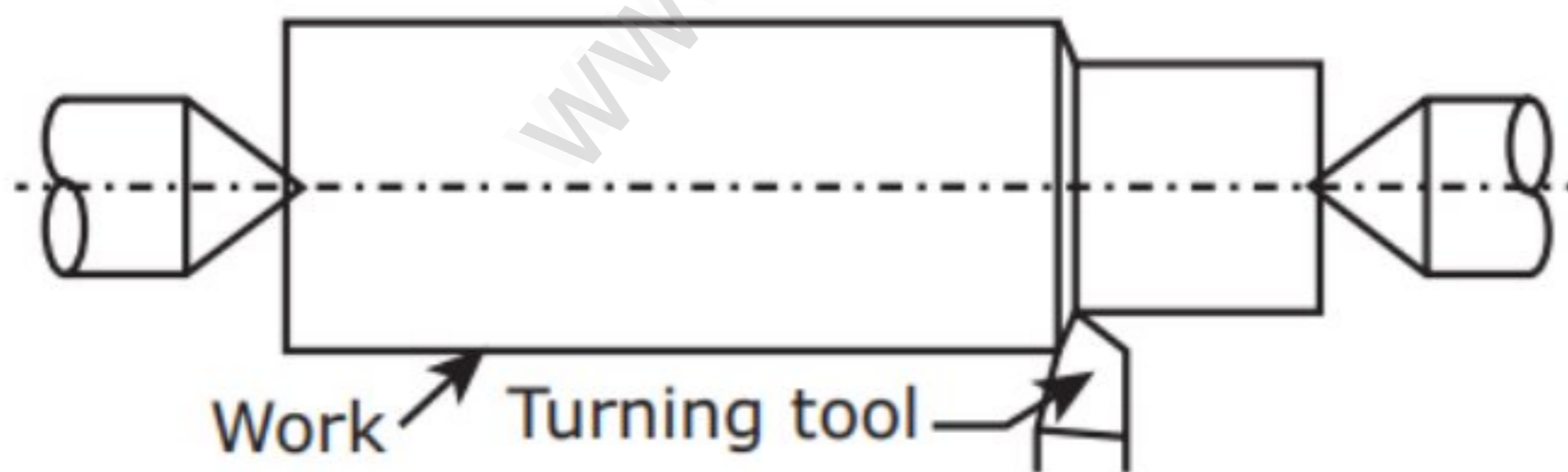


2. Explain with neat sketch of a stepcone pulley drive mechanism.

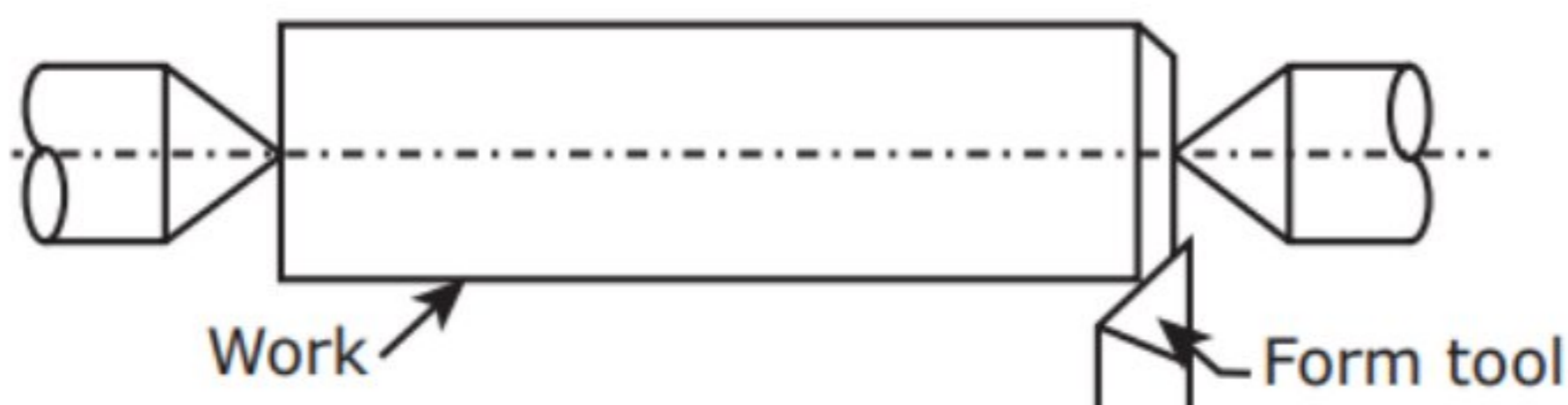
It is simple in construction. A stepped cone pulley is attached with the spindle contained within the headstock casting. The cone pulley has four steps (A, B, C D). Another cone pulley having four steps (E, F, G and H) is placed parallel to the spindle cone pulley. Both the cone pulleys are connected by a flat belt. The belt can be arranged between any one of the four steps AH, BG, CF and DE. The cone pulley (EFGH) at the bottom is connected to the electric motor by a 'V' - belt. So the cone pulley at the bottom rotates at a particular speed. If the belt is placed on the smaller step of the spindle cone pulley, the spindle speed will be increased. For example, when the belt is arranged between A & H the spindle speed will be high. When it is between D & E, the speed will be low.



3. Explain any two operations performed in lathe with neat sketch.

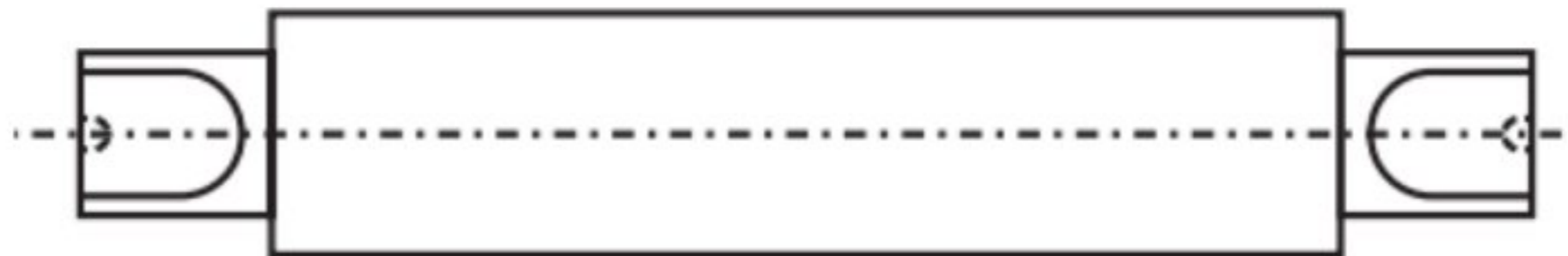


Straight turning is a process of removing excess material from a work piece to produce a cylindrical surface by using a turning tool. The tool is fed parallel to the rotation axis of the work piece

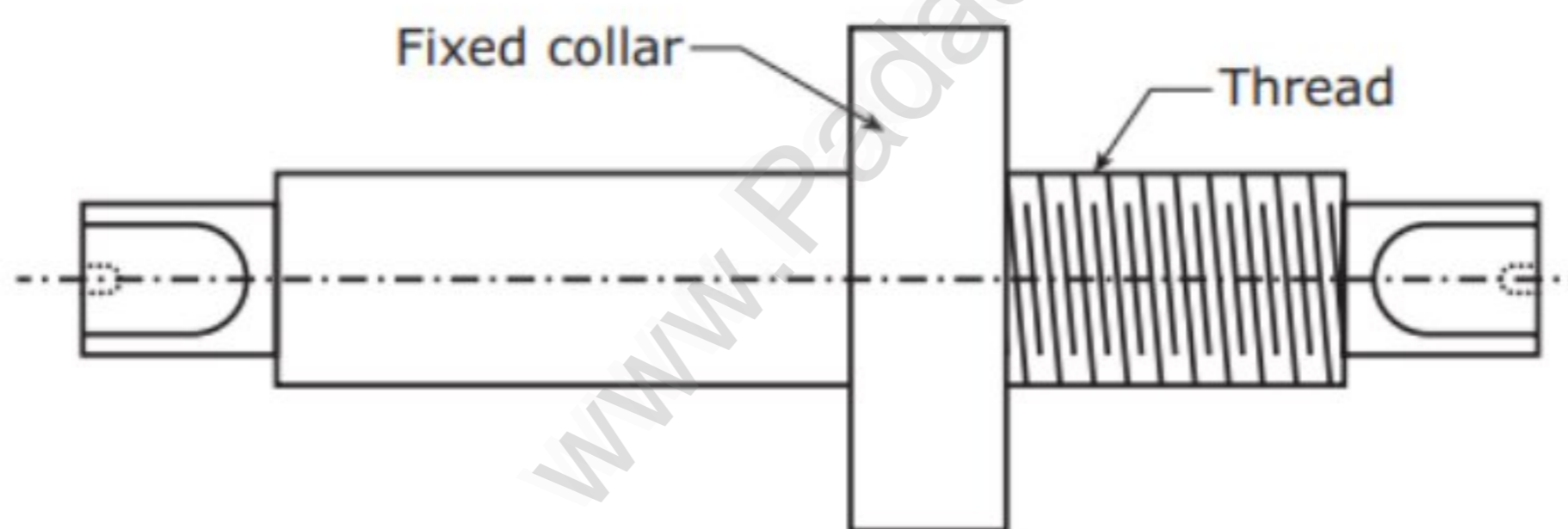


Chamfering is the operation of beveling the extreme end of the workpiece. The form tool used for taper turning may be used for this purpose. Chamfering is an essential operation after thread cutting so that the nut may pass freely on the threaded workpiece

4. Explain any two work holding devices in a lathe with suitable diagrams.



The body of the plain mandrel is slightly tapered to provide proper gripping of the workpiece. The taper will be around 1 to 2 mm for a length of 100 mm. It is also known as solid mandrel. This type is most commonly used in industries



It is threaded at one end and a collar is attached to it. Workpieces having internal threads are screwed on to it against the collar for machining.

5. Sketch and explain the taper-turning by using the Compound rest method.

The compound rest of the lathe is attached to the circular base graduated in degrees, which may be swiveled and clamped at any desired angle. The angle of taper is calculated using the formula

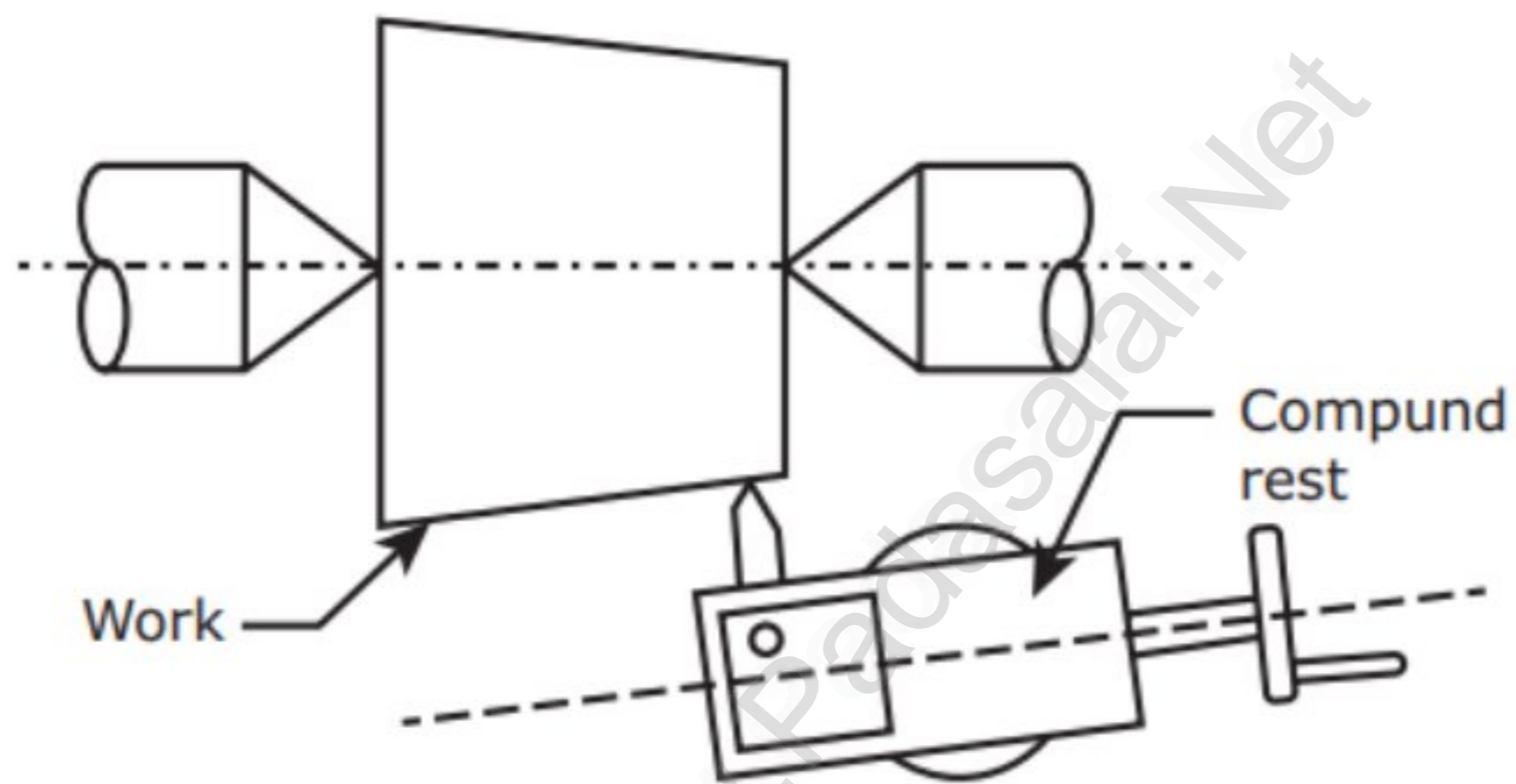
$$\tan \theta = \frac{D - d}{2l}$$

Where

D – Larger diameter

d – Small diameter

l – Length of the taper



Compound Rest Method

2. DRILLING MACHINE

- The inventor of first electric drilling machine is
 - Henry Maudslay
 - Arthur James Arnot**
 - Eli Whitney
 - James Nasmyth
- The drilling machine used in constructional work is,
 - Bench drilling machine
 - Portable drilling machine**
 - Gang drilling machine
 - Multi spindle drilling machine
- Counter - bore is a _____
 - Multi - point cutting tool**
 - Single point cutting tool
 - Parting tool
 - Saw teeth cutting tool
- The size of the hole can be drilled in radial drilling machine
 - above 10 mm
 - above 12 mm
 - above 50 mm**
 - above 70 mm
- Twist drills are made of _____
 - Low carbon steel
 - High Speed steel or High carbon steel**
 - Brass
 - Ceramic
- The angle between three jaws of a drill chuck is _____
 - 118°
 - 120°**
 - 135°
 - 59°
- The formula to calculate tap drill size is _____
 - $D=T + 2d$
 - $D=T \times 2d$
 - $D=T - 2d$**
 - $D=T \div 2d$
- The drift is made up of _____
 - Carbon steel
 - Tool steel
 - Hard steel**
 - High speed steel
- Name of the groove in drill is _____
 - V-type groove
 - U-type groove
 - Flute**
 - Straight type groove

3 MARKS

1. Define - "Drilling"

Drilling is the operation of producing a new cylindrical hole of required diameter and depth by removing metal by the rotating edge of a cutting tool called drill.

2. Mention any four types of drilling machine

- Hand drilling machine.
- Sensitive drilling machine

3. Radial drilling machine

4. Gang drilling machine

3. What are the special features of radial drilling machine.

To make internal threads in a hole.

To drill inclined holes on the work piece

To drill holes at different places of the work

4. What are the different types of drills?

1. Flat drill

2. Straight fluted drill

3. Twist drill

4. Centre drill

5. What are the uses of “Flute” in a drill?

To allow the chips to escape ,,

To cause the chips to curl

Flutes form the cutting edges on the point.

6. Mention any four types of tool - holding devices in drilling machine.

1. a sleeve 2. a socket 3. a drill chuck

7. State any two differences between the process of reaming and boring.

Reaming	Boring
Reaming is a accurate way of sizing and finishing the already drilled hole	Drilling is a operation of enlarging the already drilled hole
The tool used for reaming is known as reamer	The tool used for boring is known as boring tool
Reamer is a multipoint cutting tool	Boring tool is a single point cutting tool

8. In which situation boring is needed?

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.

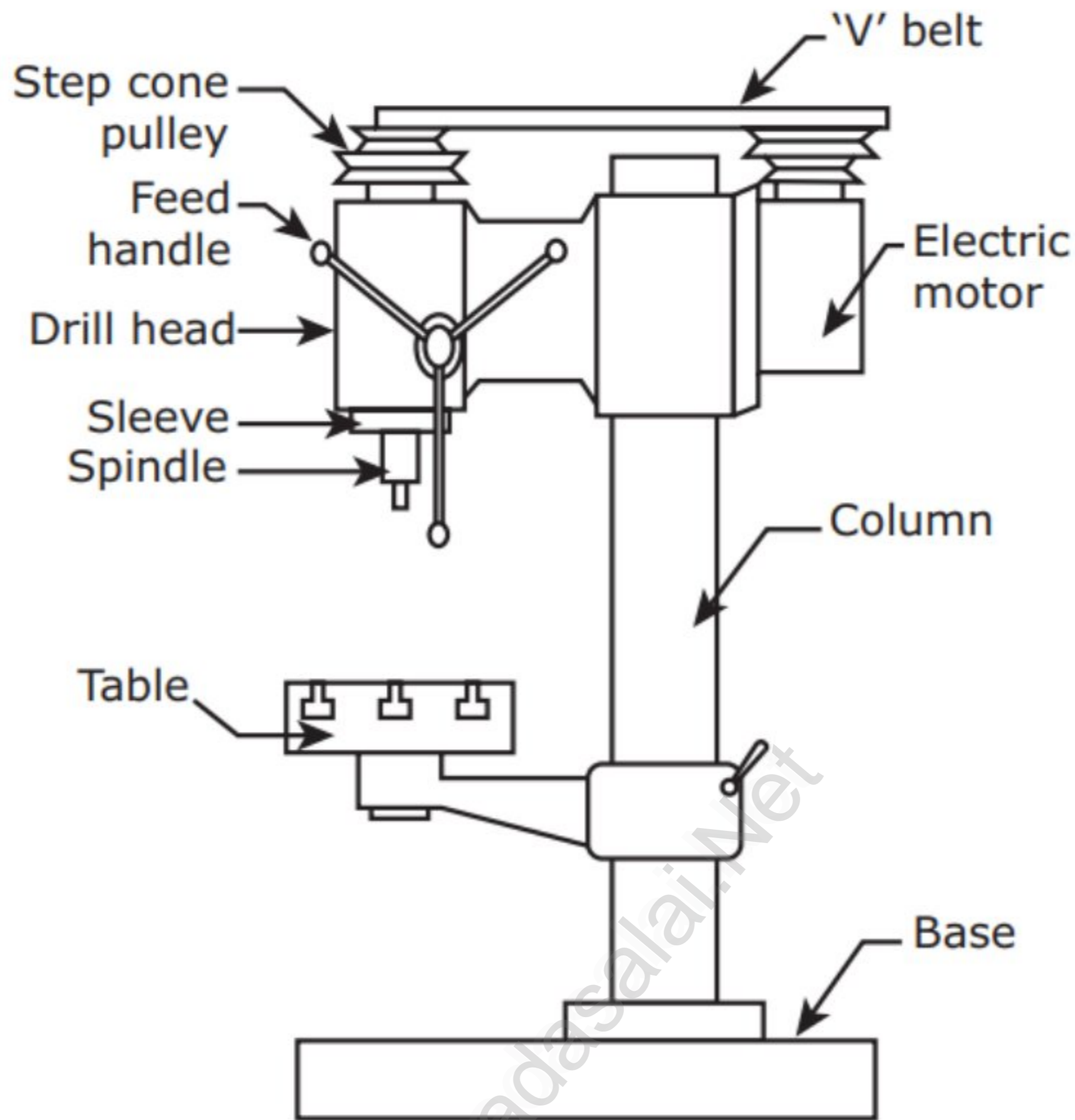
9. Define “Cutting speed” of a drilling machine.

The cutting speed in a drilling operation refers to the peripheral speed of a point on the cutting edge of the drill.

$$\text{Cutting speed} = \frac{\pi DN}{1000} \text{ m/min}$$

5 MARKS

1. Draw and explain a bench drilling machine.



It is designed for drilling small holes at high speeds in jobs. The base of the machine is mounted either on a bench or on the floor. It can handle drills of diameter from 1.5mm to 15.5 mm the drill is fed with work purely by hand.

BASE

Base The base is made of cast iron and so can withstand vibrations. It may be mounted on a bench or on the floor holes are provided.

Column

The column may be round or box section and it stands vertically on the base at one end. It supports the work table and the drill head.

Work Table

The table is mounted on the vertical column and can be adjusted by hand 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.

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.

2. How is the size of a drilling machine specified?

1. A portable drilling machine is specified by the maximum diameter of the drill that it can hold.

2. The size of the sensitive and upright drilling machines are specified by the size of the largest work piece

3. The size of a radial drilling machine is specified by the diameter of the column and length of the arm, spindle speeds and feeds etc.

4. diameter of table, maximum travel of the spindle, numbers and range of spindle speeds and feeds available.

5. Morse taper number of the drill spindle, floor space required weight of the machine and horse power of the motor.

3. Explain any two types of drill holding devices.

1. directly fitting in the spindle

2. a sleeve

3. a socket

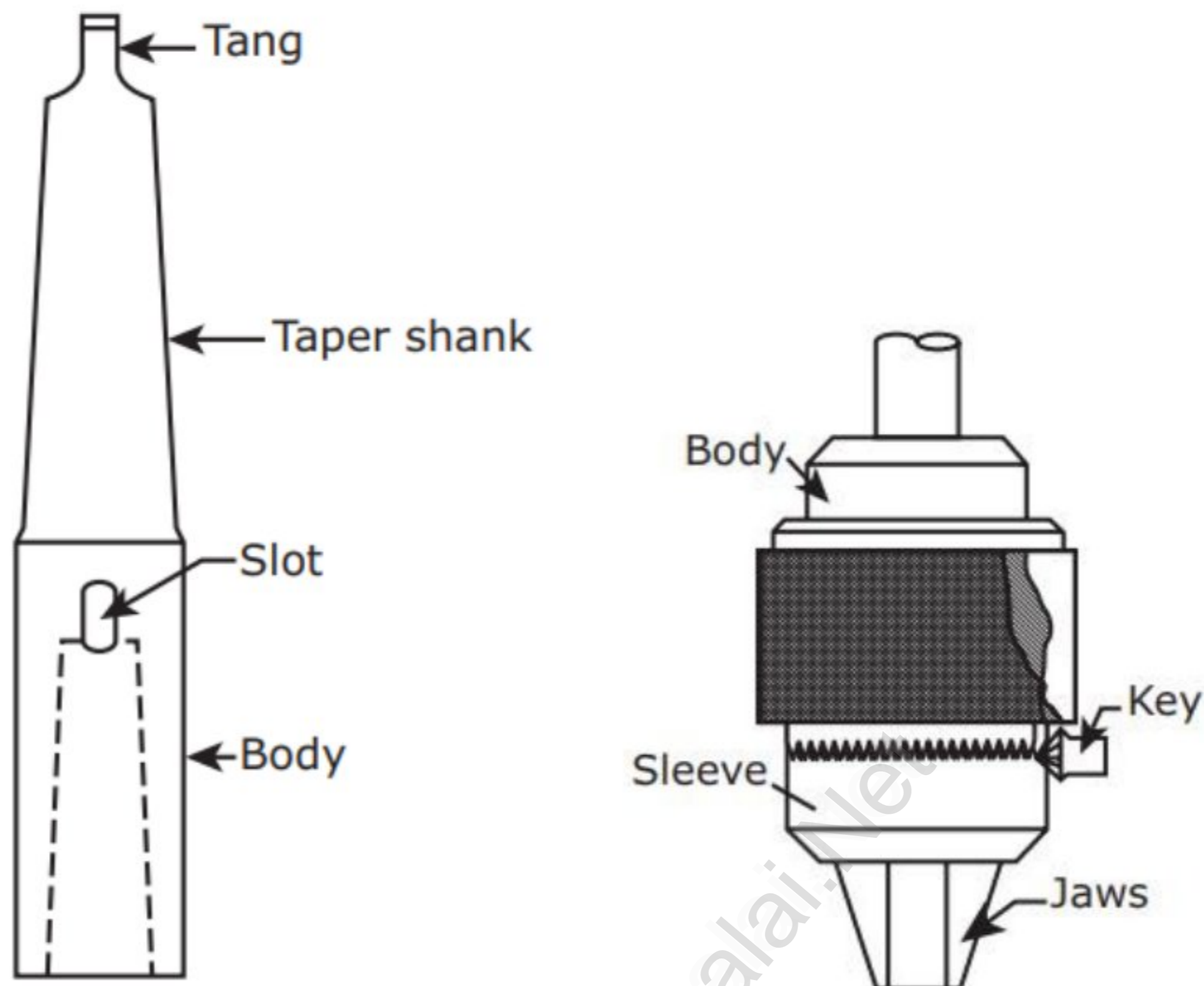
4. a drill chuck

5. special attachments

a. Tapping attachments

b. Floating holder.

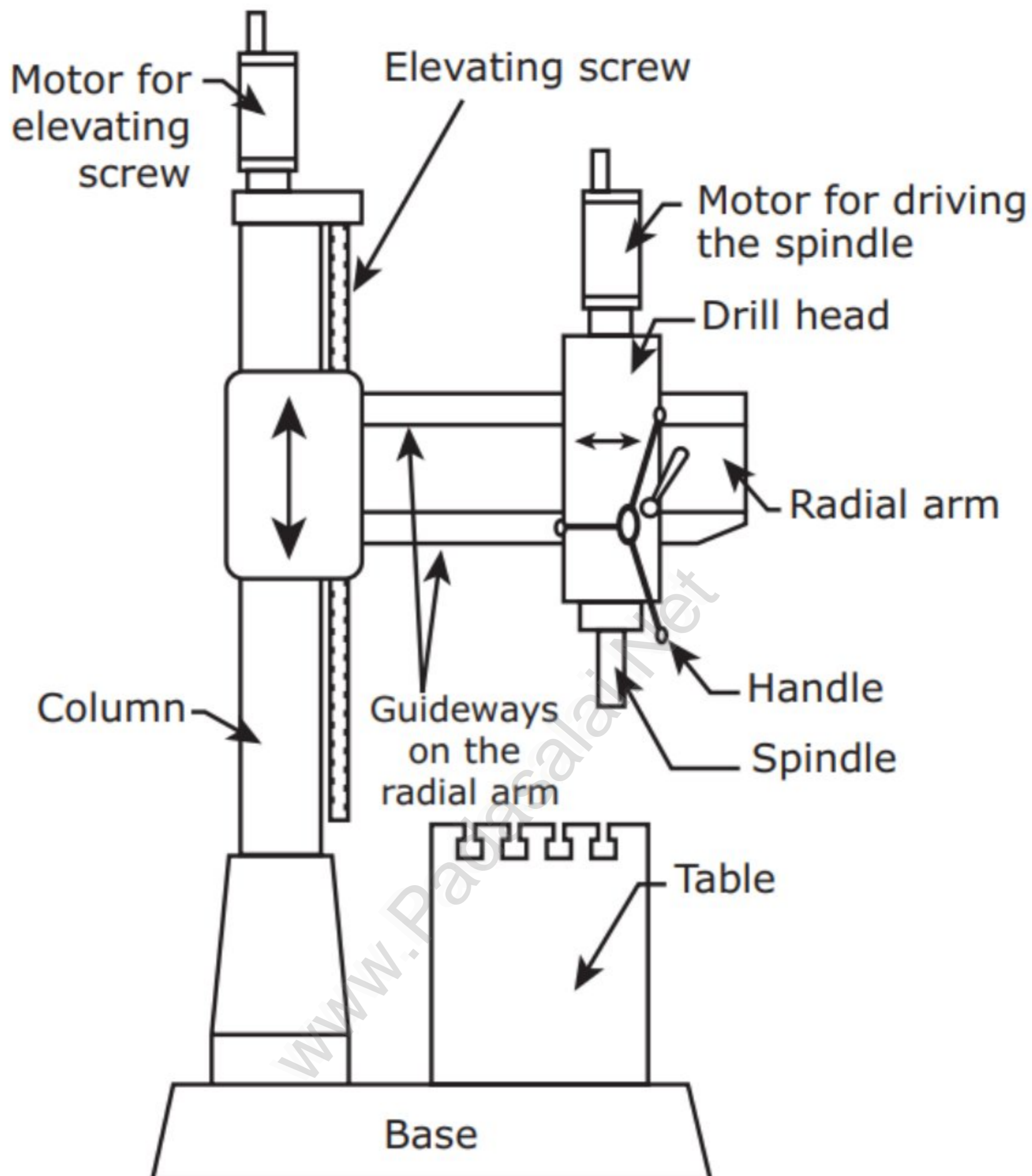
When the tapered tool shank is larger than the spindle taper, drill sockets are used to hold the tool. Drill sockets are much longer in size than the drill sleeves. A socket consists of a solid shanks attached to the end of a cylindrical body. The taper shank of the socket conforms to the taper of the drill spindle and fits into it. The body of the socket has a tapered hole larger than the drill spindle taper into which the taper shank of any tool may be fitted. The tang of the socket fits into slot of the spindle and the tang of the tool fits slot of the socket



This type of chuck is particularly adapted for holding smaller size of drills having straight shanks. The drill chuck has a taper shank at top portion of the chuck, which fits into the taper hole of the spindle. Bevel teeth are cut round the sleeve body which locates at the centre portion of the chuck. At the bottom of the chuck, there are three jaws are fitted at 120° each other. It is used to hold the drill bit. The jaws are made of spring steel

10 MARKS

1. Explain the construction of a radial drilling machine.



The radial drilling machine is intended for drilling and tapping on medium to large and heavy work pieces. It is used in mass production factories and to drill the holes at a diameter of 50 mm and above.

BASE

The base is a large rectangular casting and mounted on the floor on the shop. Its top surface is accurately finished to support a column at one end and the table at the other end. T -slots are provided on it for clamping the work pieces.

COLUMN

The column is a cylindrical casting which is mounted vertically at one end of the base. It supports the radial arm and allows it to slide up and down on its face. The vertical adjustment of the radial arm is effected by rotating a screw passing through a nut attached to the arm.

RADIAL ARM

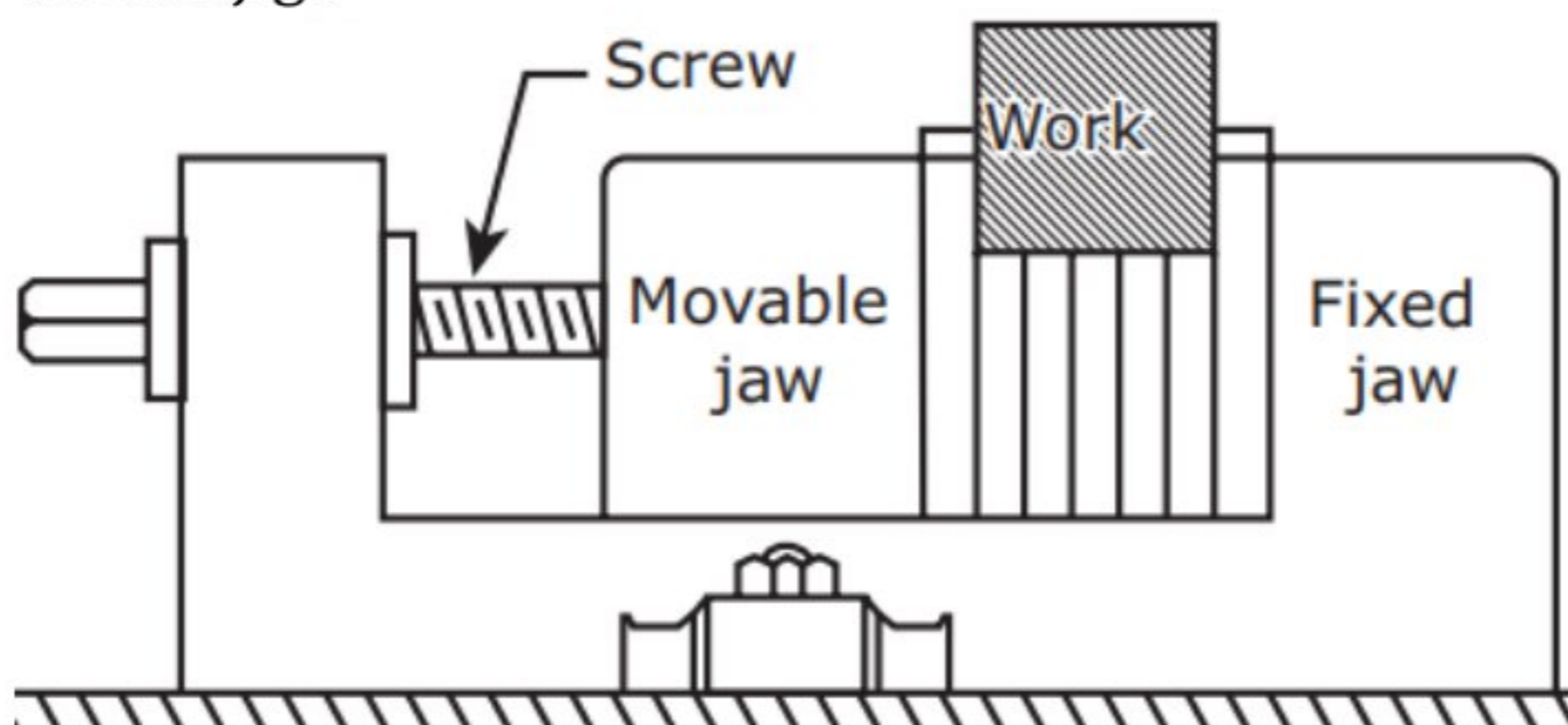
The radial arm is mounted on the column parallel to the base and can be adjusted vertically. The vertical front surface is accurately machined to provide guide ways for the drill head. The drill head can be adjusted along these guide ways according to the location of the work. The arm may be swung at 360 around the column.

DRILL HEAD

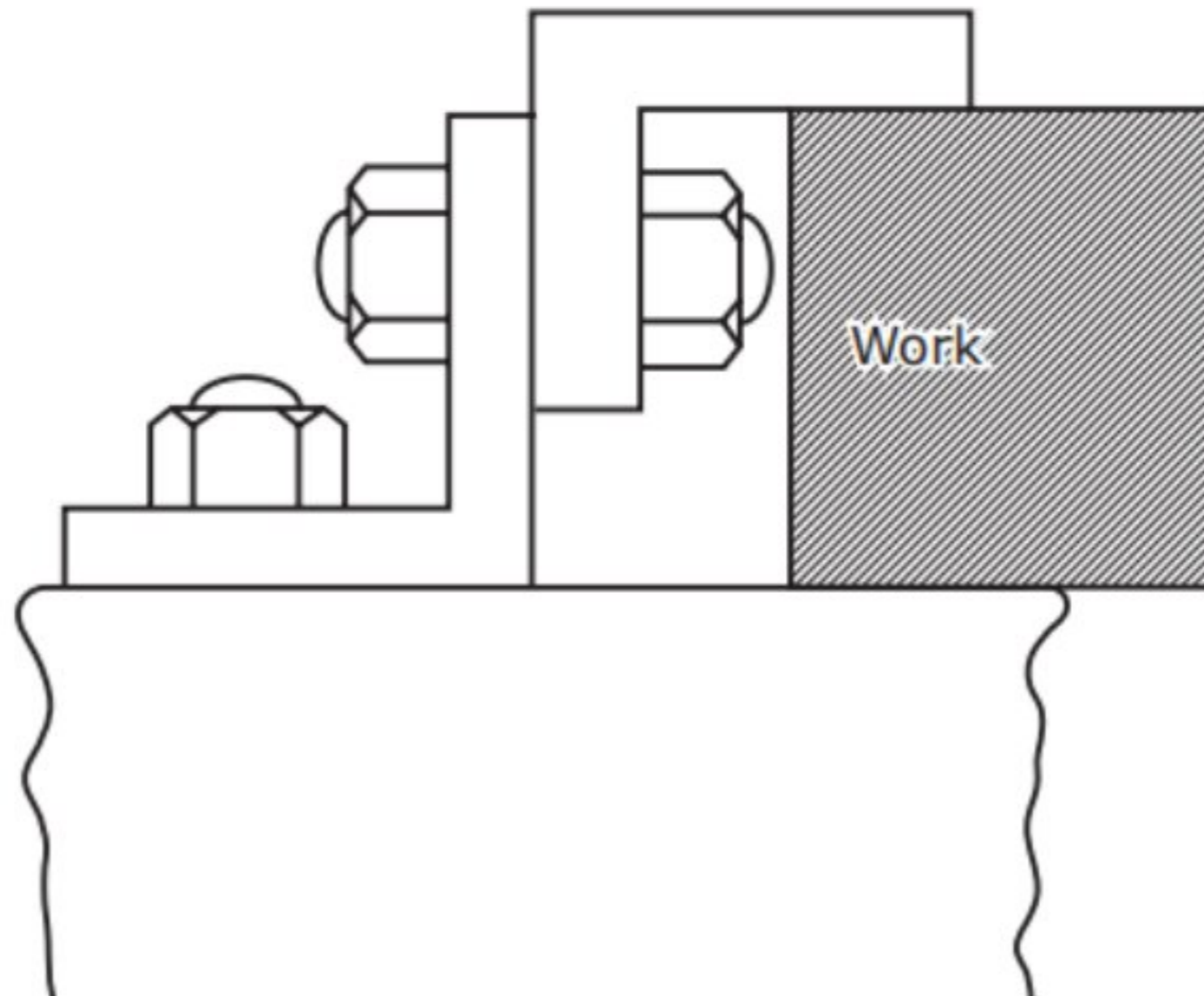
The drill head is mounted on the radial arm and houses all mechanism for driving the drill at different speeds and feed. A motor is mounted on the top of the drill head for this purpose.

2. Explain any two work - holding devices used in a drilling machine.

1. Drill vise
2. T-bolt, nut and clamps
3. step block
4. Plain vise
5. V - block
6. Angle plate
7. Drill jigs

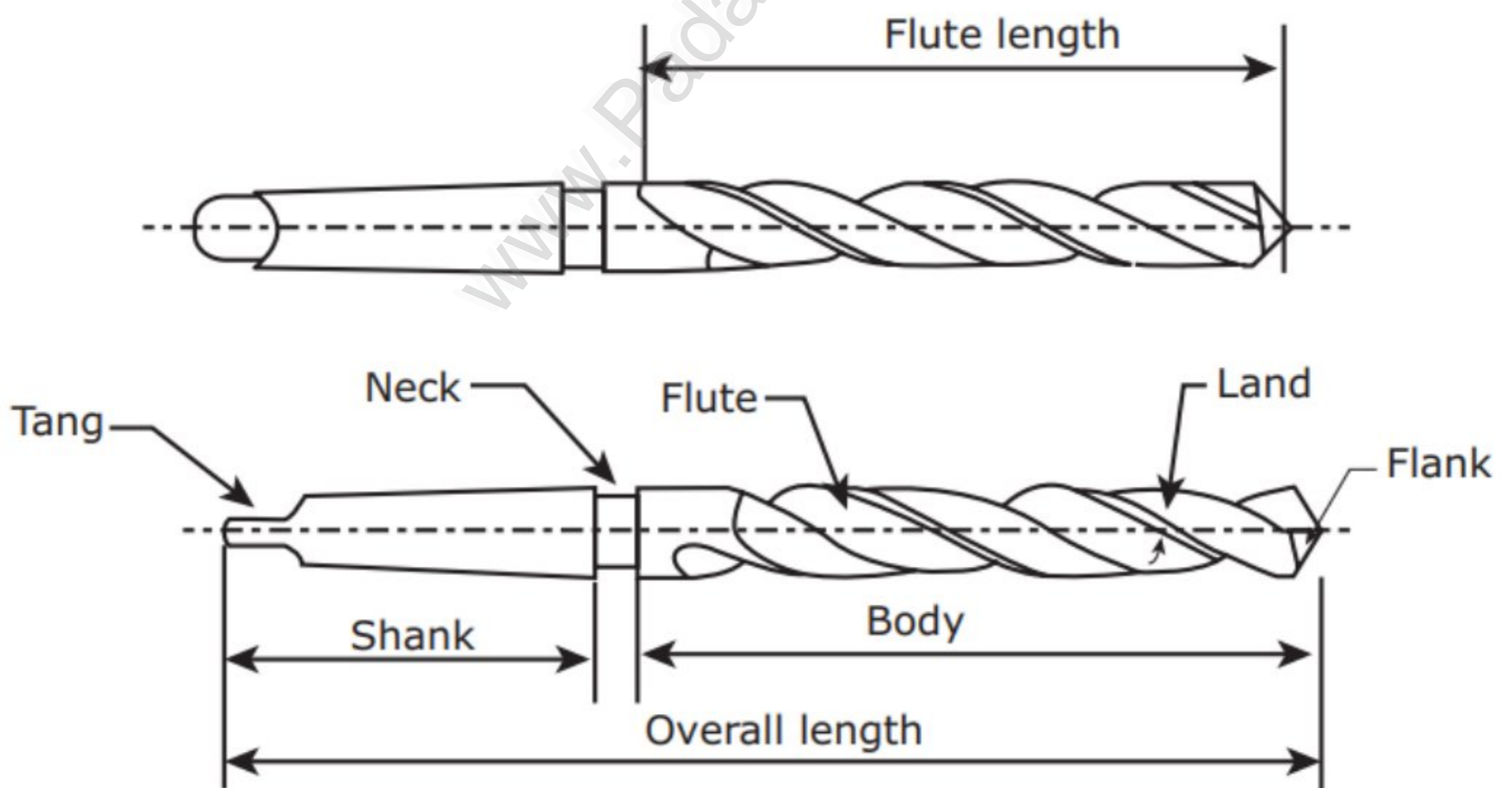


Vise is one of the most important devices used for holding work piece on a drilling machine table. The work is clamped in a vise between a fixed jaw and a movable jaw.



The angle plates have two faces at rightangle to each other and made of cast iron. All the sides of a angle plate are machined accurately. Slots and holes are provided on both the faces of the angle plate. Work is clamped on one of its faces by means of bolts and nuts

3. Explain twist drill parts with neat sketch.



Body

It is the part of the drill from its extreme point to the commencement of the neck. If present otherwise it is the part extending up to the commencement of the shank

Shank

It is part of the drill by which it is held and driven. It is found just above the body of the drill. The shank may be straight (or) taper.

Tang

The flattened end of the taper shank is known as tang. It is meant to fit into a slot in the spindle (or) socket.

Neck

It is the part of the drill which is diametrically undercut between the body and the shank of the drill.

Land

It is the cylindrically ground surface on the leading edges of the drill flutes adjacent to the body clearance surfaces.

Flutes

The grooves in the body of the drill are known as flutes.

Flutes form the cutting edges on the point.

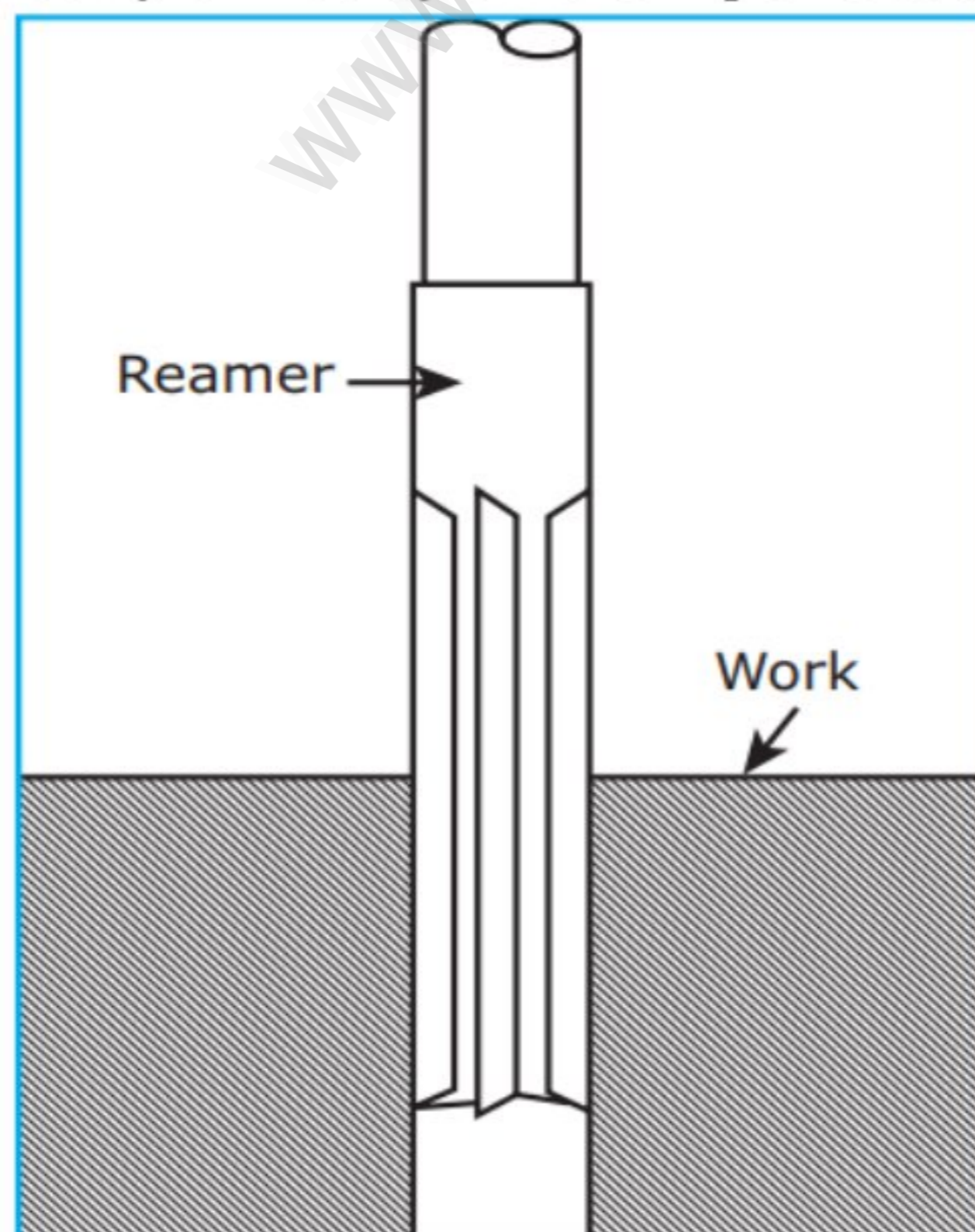
To allow the chips to escape

To cause the chips to curl

To permit the cutting fluid to reach the cutting edges

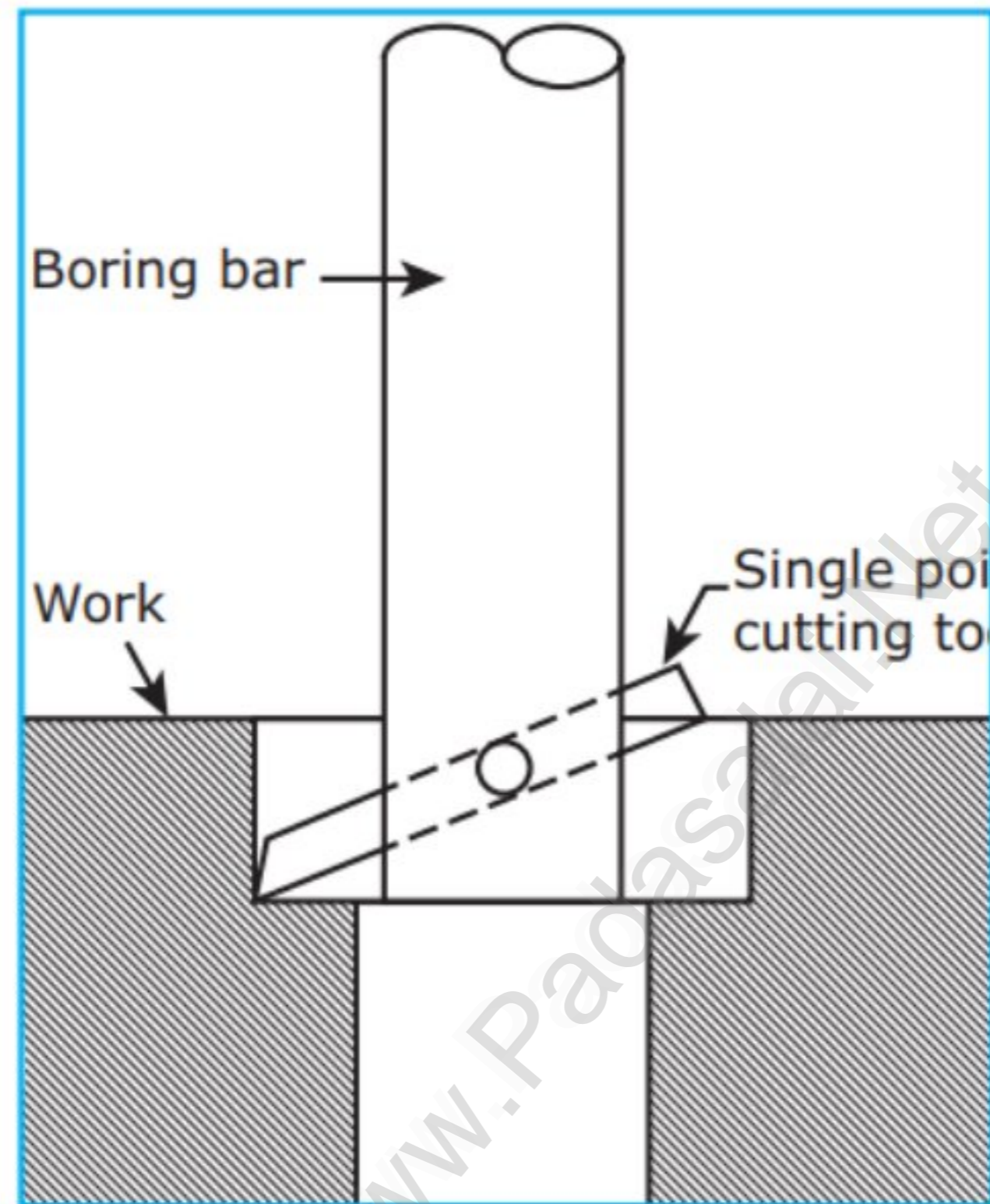
4. Explain any two operations performed in a drilling machine.

Reaming is an accurate way of sizing and finishing a hole which has been previously drilled by a multi - point cutting tool known as reamer.



Boring is the operation enlarging the diameter of the hole previously made
To enlarge a hole by means of an adjustable cutting tool

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



3. SHAPING MACHINE

- The shaping machine was designed by_____
 - Henry Maudslay
 - Eli Whitney
 - Michael Faraday
 - James Nasmyth**
- The operation mainly done on a shaping machine is
 - Turning
 - Drilling
 - Machining a flat surface**
 - Thread cutting
- The part involved in reciprocation by quick return is
 - Table
 - Ram**
 - Column
 - Crossrail
- The ratio of forward stroke time to return stroke time is
 - 3:2**
 - 5:3
 - 1:3
 - 1:2
- The part used to lift the tool while the ram moves the returning stroke.
 - Tool head
 - Work table
 - Clapper block**
 - Cross slide

3 MARKS

1. Define "Shaping".

Shaping is a process of machining a flat surface which may be horizontal, vertical, inclined, concave or convex using a reciprocating single point tool

2. List any four parts of shaper

- Base
- Column
- Table
- Ram

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

Crank and slotted link mechanism is used to convert rotary motion into reciprocating movement of ram.

4. Define "cutting speed" of shaping machine.

In a shaper, the cutting speed is the speed at which the metal is removed by the cutting tool in a period of one minute.

5. Define "feed" of a shaping machine.

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

6. Mention the "depth of cut" of shaping machine.

Depth of cut is the thickness of metal that is removed during machining. It is the perpendicular distance measured between the machined surface and the uncut surface of the workpiece.

7. What is the use of a clapper box?

Prevents the tool cutting edge from dragging on the work surface.

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

To machine angular surfaces like 'V' grooves and dove tail grooves.

5 MARKS

1. List out the types of shaping machines.

1. According to the type of driving mechanism
 - a. Crank type
 - b. Hydraulic type
 - c. Geared type
2. According to the design of the table
 - a. Plain shaper
 - b. Standard shaper
 - c. Universal shaper
 - d. Heavy duty shaper
3. According to the position and travel of ram
 - a. Horizontal shaper
 - b. Vertical shaper
4. According to the type of cutting
 - a. Push cut shaper
 - b. Draw cut shaper

2. Write short notes on

a. Changing the stroke length of the ram

The stroke length is calculated to be nearly 30 mm longer than the work. The position of stroke is adjusted that the tool starts to move from a distance of 25 mm before the beginning of the cut and continues to move 5 mm after the end of the cut. For example as shown in Figure, the length of the work is 100 mm. The stroke length of the ram is calculated to be 130 mm. (25+100+5).

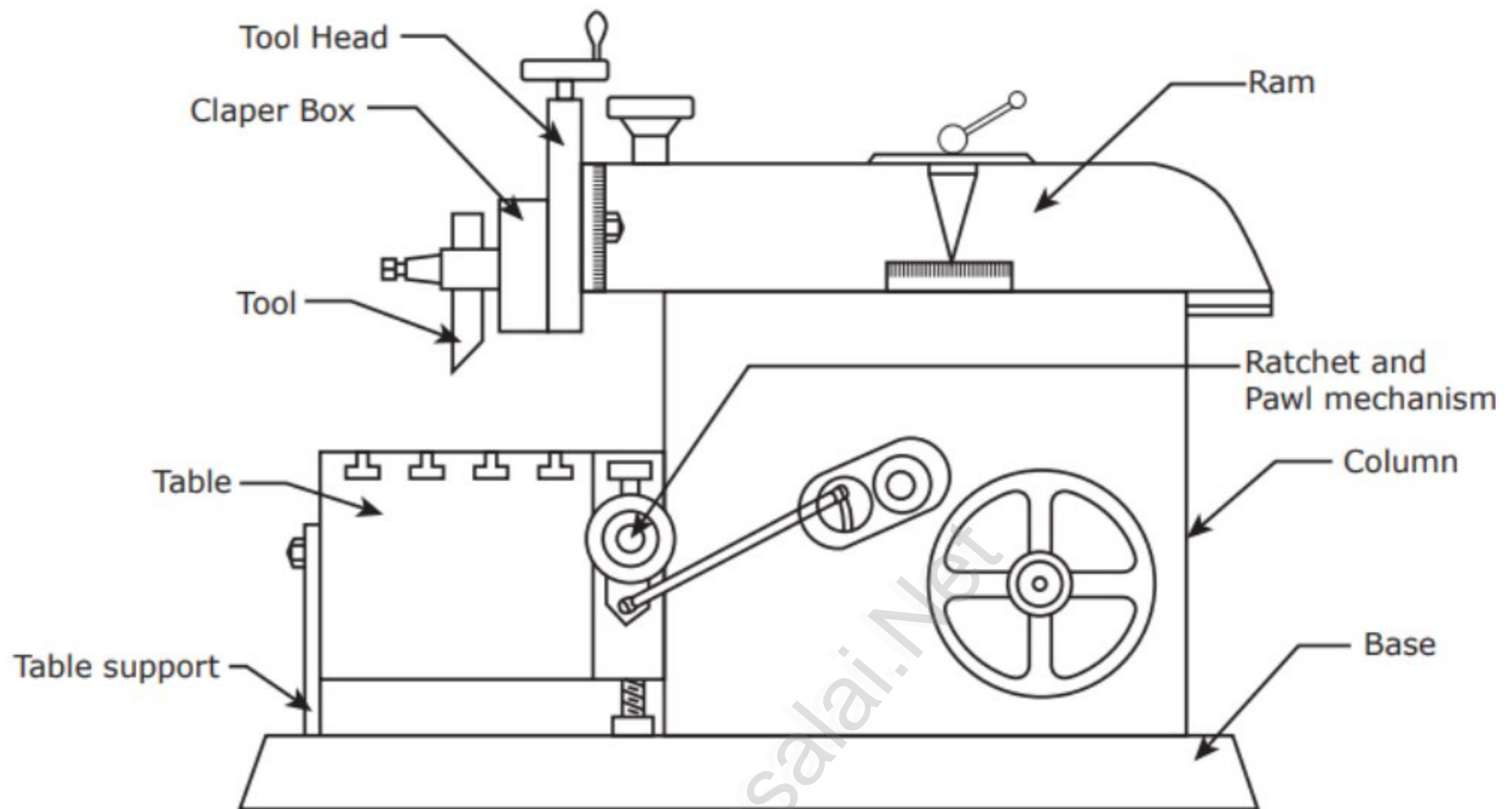
b. position of the ram.

The crank pin fastened to the sliding block can be adjusted by a lever placed outside the column. Through the bevel gears placed at the centre of the bull gear, the radial slide lead screw can be rotated. This rotation of leadscrew changes the position of the sliding block to move towards or away

from the bull gear centre. The stroke length of the ram is adjusted by placing the sliding block at a required position from the centre of the bull gear.

10 MARKS

1. Draw a neat diagram of a shaping machine and explain its important parts.



Base

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

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 vertically.

Saddle

The saddle is mounted on the cross rail. It holds the table rigidly on its top. The saddle can be moved in crosswise direction by rotate the cross-feed screw by hand or power.

Table

It is an important part used for holding the work firmly on it. It is mounted on the saddle which is located above the crossrail.

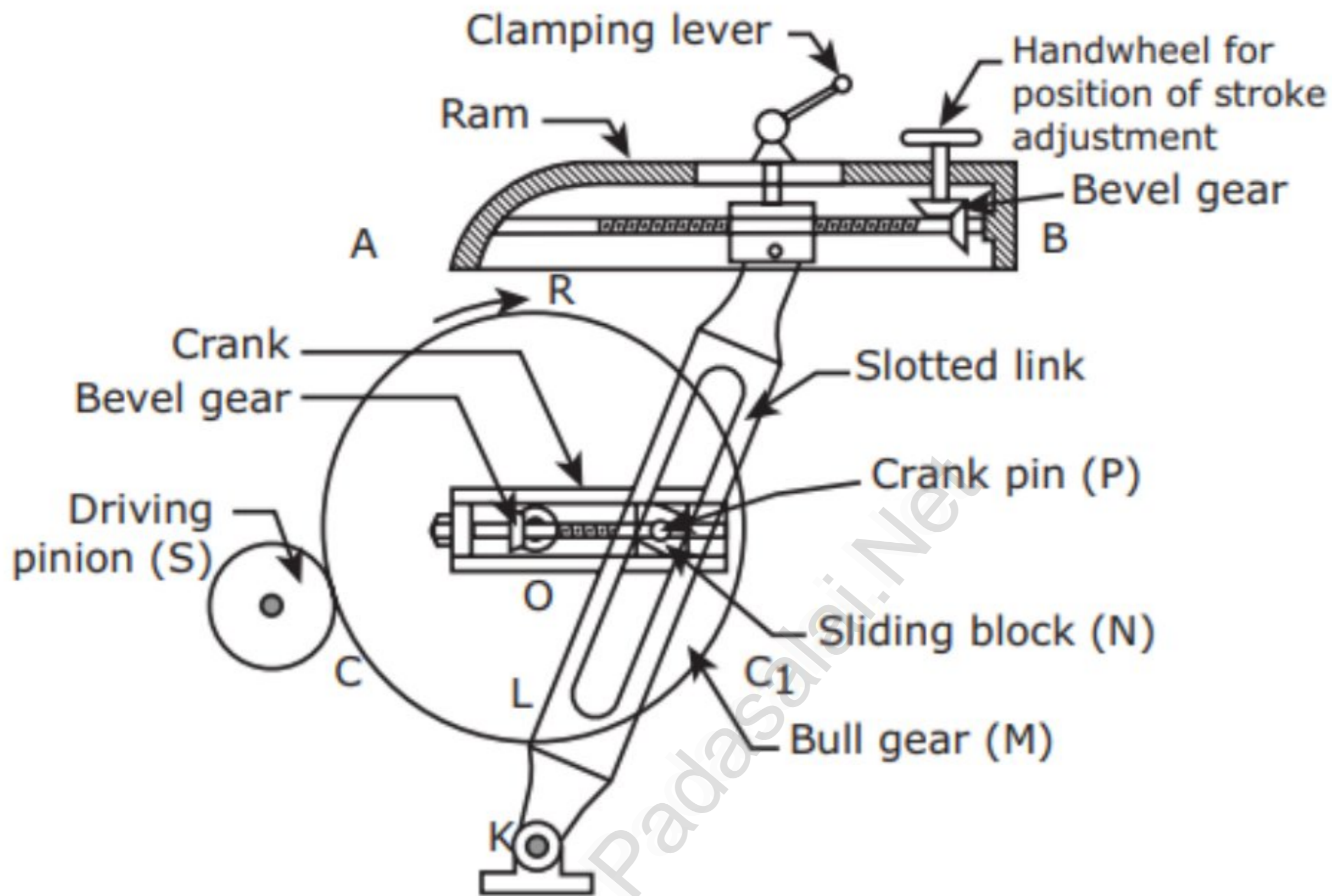
Ram

Ram carries the tool head on its front end. It reciprocates on the accurately machined guideways on the top of the column.

Tool head

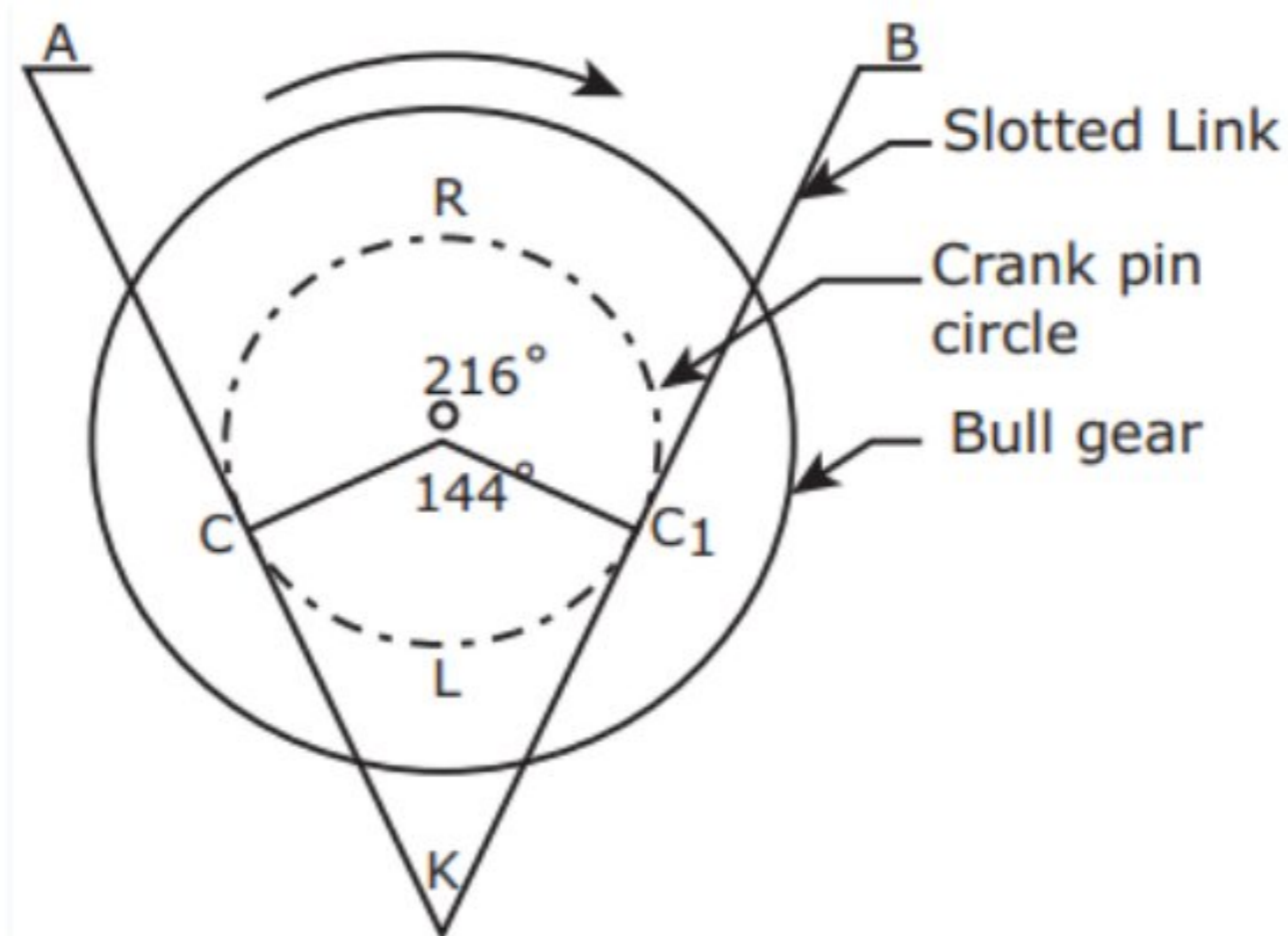
The tool head is fitted on the face of the ram and hold the tool rigidly. It provides vertical and angular feed movement of the tool.

2. Explain the crank & slotted link mechanism of quick return of the ram with a diagram.



An electrical motor runs the driving pinion (S) at a uniform speed. This pinion makes the bull gear (M) to rotate at a uniform speed. Bull gear is a large gear fitted inside the column. The point 'O' is the centre of the bull gear. A slotted link having a long slot along its length is pivoted about the point 'K'. A sliding block 'N' is fitted inside the slot and slides along the slot, which is in the slotted link. 'P' is the crank pin and 'OP' can be considered as a crank. When the bull gear rotates, the sliding block also rotates in the crank pin circle. This arrangement provides a rocking movement to the rocker arm. As the top of the slotted link is connected to the ram, the ram reciprocates horizontally. So, bull gear rotation is converted into the reciprocating movement of the ram. Quick return mechanism As shown in the diagram, 'KA' indicates the starting point of the forward cutting stroke and 'KB' the end of the cutting stroke. The rotation of the crank 'OP' in clockwise direction through the angle CRC_1 refers to the forward cutting stroke. The rotation of the crank in the same direction through the angle C_1LC refers to the return stroke. As the angle C_1LC is smaller than the angle CRC_1 , the

time taken for the return stroke is less than the forward stroke. So, it is evident that the speed at which the ram travels during return stroke is more.

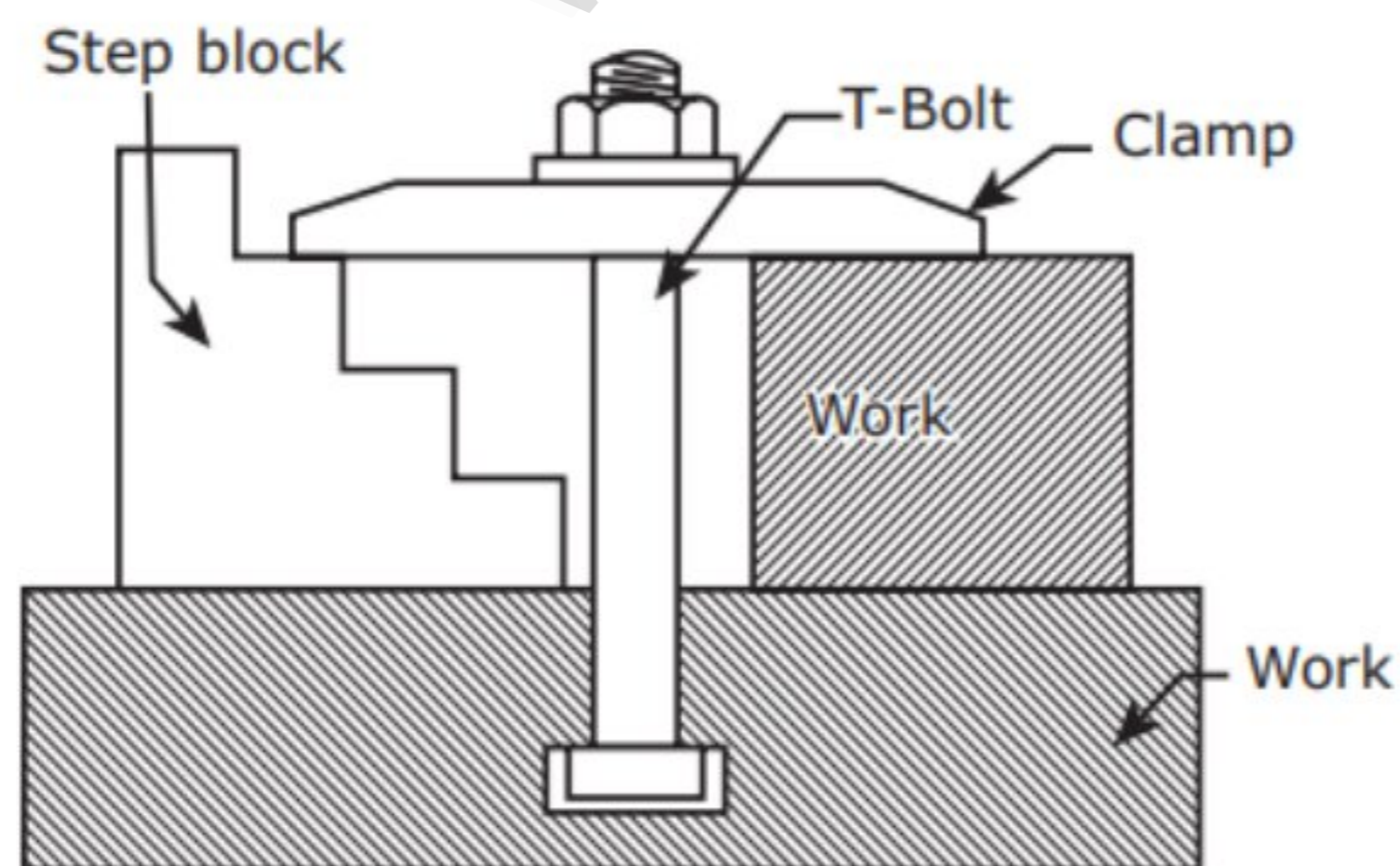


Time taken for forward cutting stroke	=	angle CRC_1
--	---	---------------

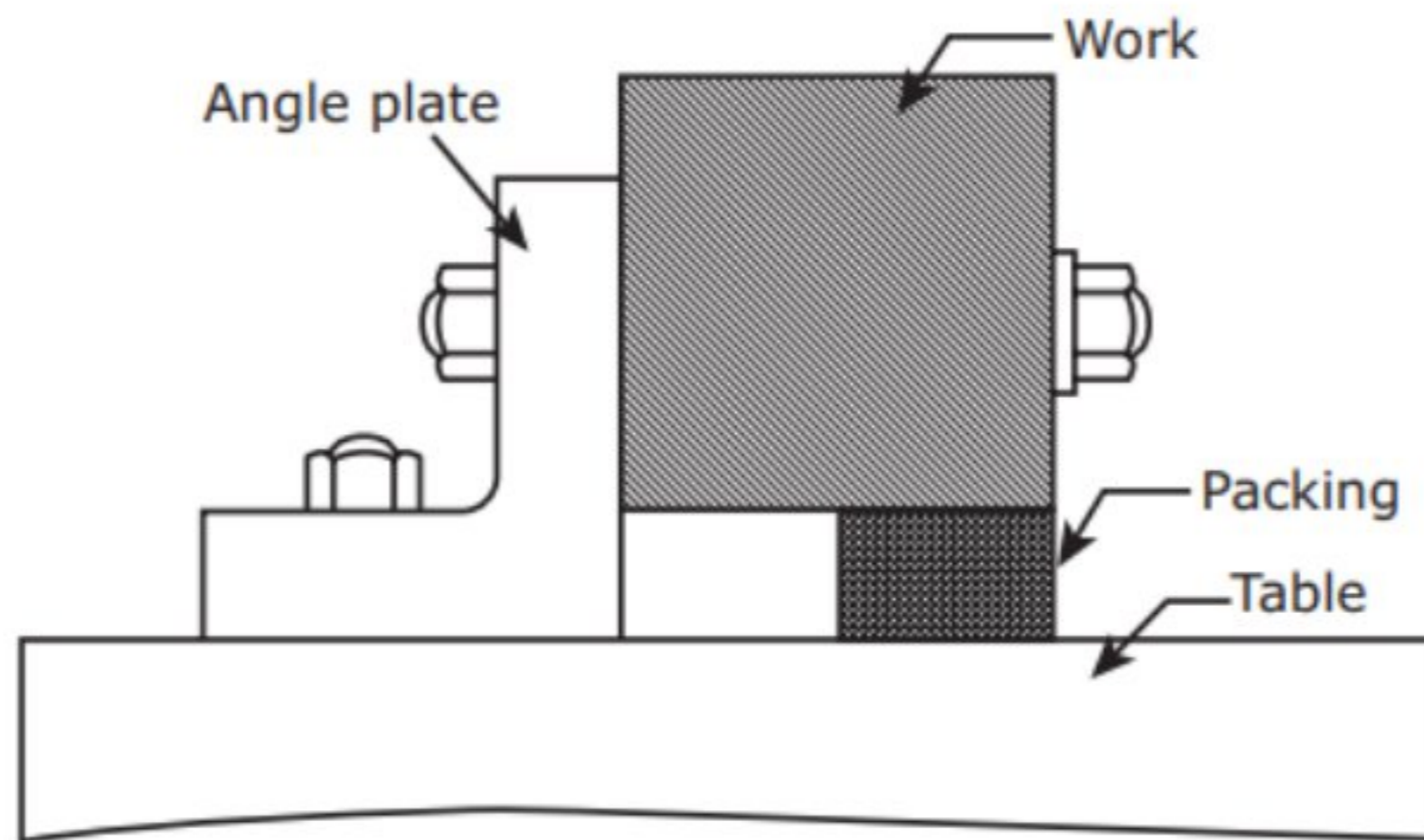
Time taken for the idle return stroke	=	angle C_1LC
		$= 216^\circ / 144^\circ$
		$= 3 / 2,$

In some machines this ratio can be set as 7/5.

3. Explain any two work holding devices used in a shaping machine with diagrams.

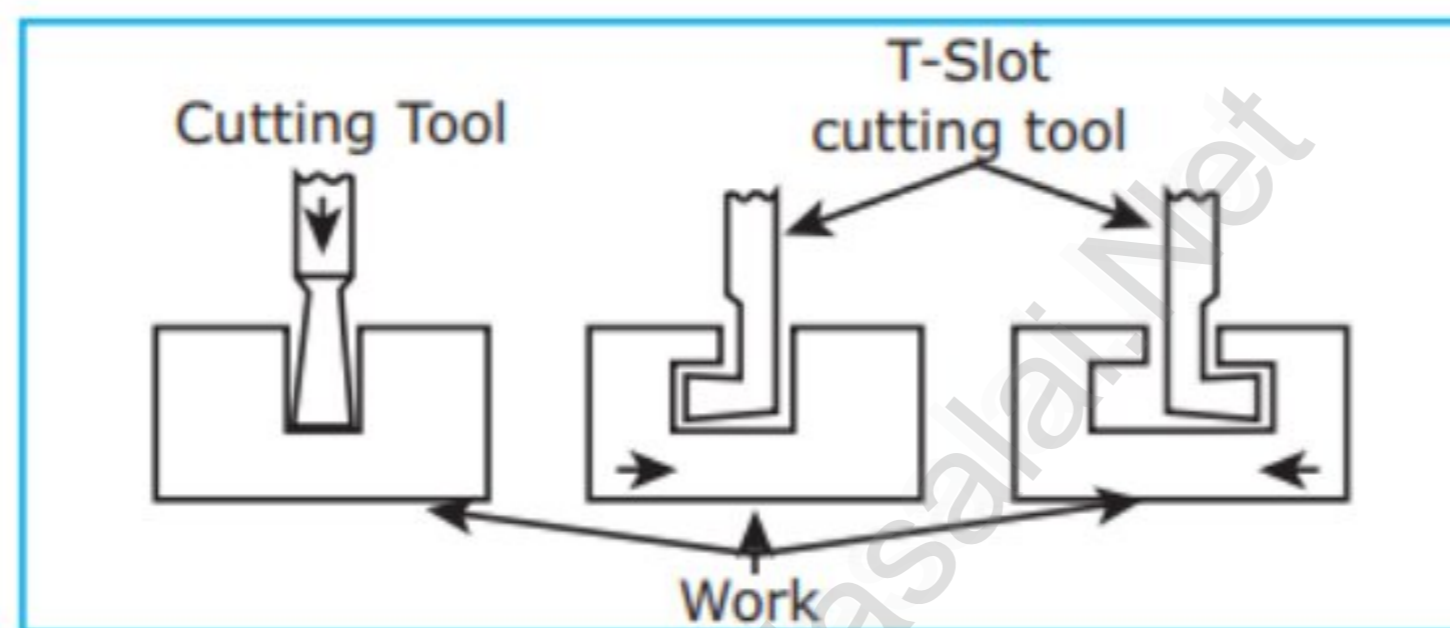


The step blocks are used in combination with T-bolts and clamps to hold the work directly on the machine table. The t-bolts are fitted in the T-slots of the machine table. One side of the clamp holds the work and the other side rests on a step of the step block. The different steps of the block are useful in leveling the clamp.

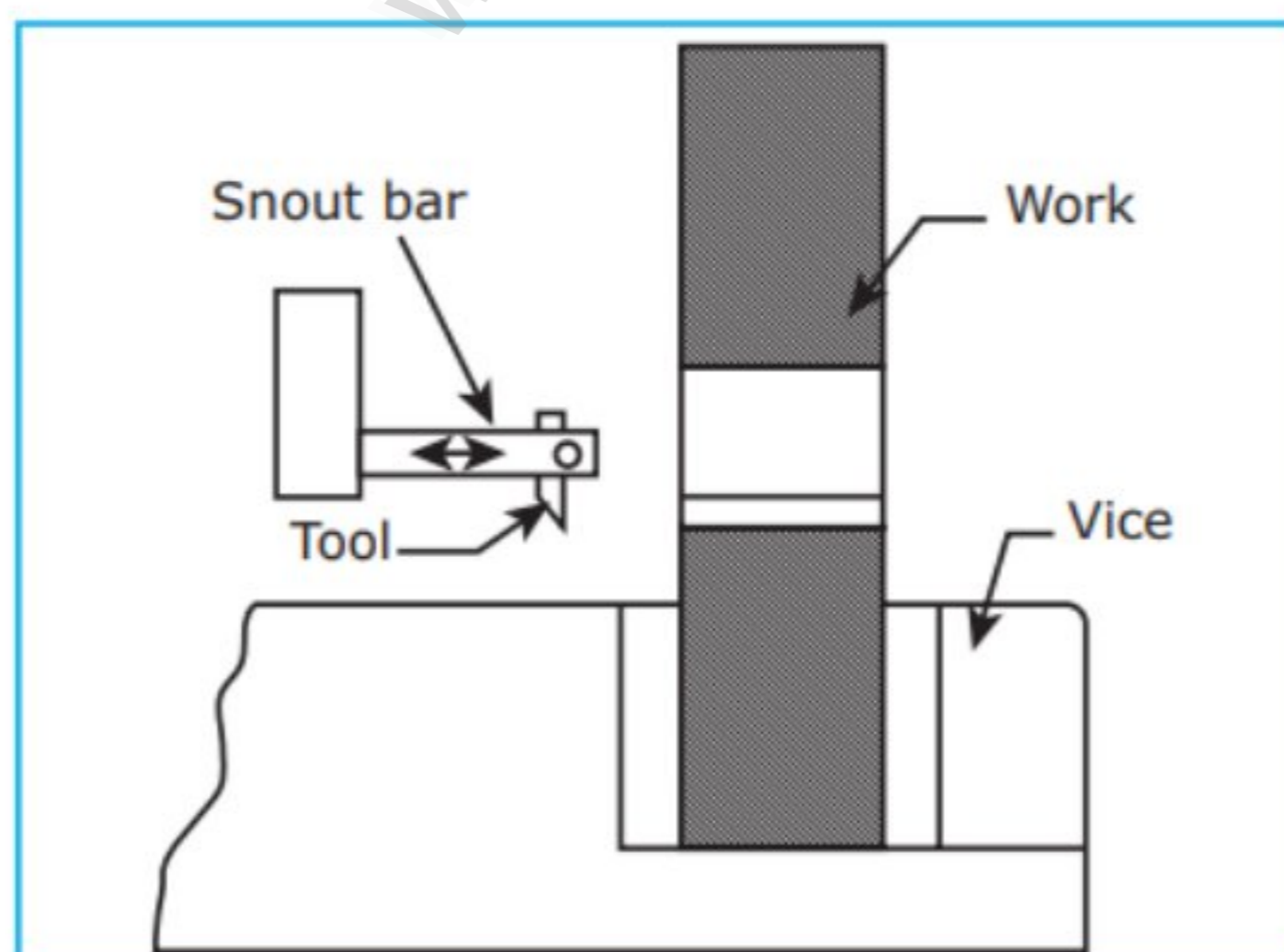


Angle plate resembles the English alphabet 'L'. It is accurately machined to have two sides at right angles. Slots are provided on both sides. One of the sides is bolted to the machine table and the workpiece are held on the other side.

4. Explain any two operations performed in a shaping machine with diagrams.



The shape of the T -slot is marked on the face of the work. A parting off tool is fitted on the tool post and a rectangular slot is machined at the middle for the required depth. The broad base of the 'T' slot is machined by a T-slot cutting tool.



Internal keyways are cut inside the holes of gears and pulleys. It is done by holding the tool on a special tool holder called 'snout bar'. The snout bar is directly fitted on the clapper block.

4. GRINDING MACHINE

1. The accuracy obtained by precision grinding is
 - a. **0.000025 mm**
 - b. 0.0025 mm
 - c. 0.00125 mm
 - d. 0.00625 mm
2. The cutting tool with several thousands of cutting edges is
 - a. Lathe cutting tool
 - b. Drill
 - c. **Grinding wheel**
 - d. Milling cutter
3. Bond used for making elastic grinding wheel is _____
 - a. Vitrified
 - b. Silicate
 - c. **Shellac**
 - d. Resinoid
4. The grip with which the bond holds the abrasives is known as
 - a. Grain size
 - b. **Grade of the grinding wheel**
 - c. Structure of the grinding wheel
 - d. Type of abrasive

3 MARKS

1. What is meant by grinding?

Grinding is a metal cutting operation where metal is cut by a rotating abrasive wheel. A machine that performs the grinding operation is called grinding machine.

2. Name any four types of grinding machines.

1. Hand grinding machine
2. Bench grinding machine
3. Surface grinding machine
4. Tool and cutter grinding machine

3. What are the four types of surface grinders?

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

4. List out any four operations performed in a grinding machine.

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

5. Mention any four types of bonds used in grinding wheel

1. Vitrified V
2. Silicate S
3. Shellac E
4. Resinoid B
5. Rubber R
6. Oxychloride O

6. What is meant by “glazing”?

Glazing of the wheel is a condition in which the face of the cutting edge look like glass appearance.

7. What is meant by “Loading” in a grinding wheel?

The wheel is loaded in the particles of the metal being adhere to the wheel.

8. What are the reasons for chattering?

It takes place when the spindle bearings are not fitted correctly and because of the imbalance of the grinding wheel.

9. What is meant by “grit” of the grinding wheel?

The grain size or grit number indicates the size of the abrasive grains used in making a wheel.

10. What is meant by “Grade” of the grinding wheel?

The grade of grinding wheel refers to the hardness with which the wheel holds the abrasive grains in place

11. Define Structure of the grinding wheel.

The relative spacing occupied by the abrasives and the bond is referred to as structure.

5 MARKS**1. List out the various types of nonprecision and precision grinding machines.**

The main types of non-precision grinders are

1. Hand grinding machine
2. Bench grinding machine
3. Floor stand grinding machine
4. Flexible shaft grinding machine
5. Swing frame grinding machine
6. Abrasive belt grinding machine

The main types of precision grinders are

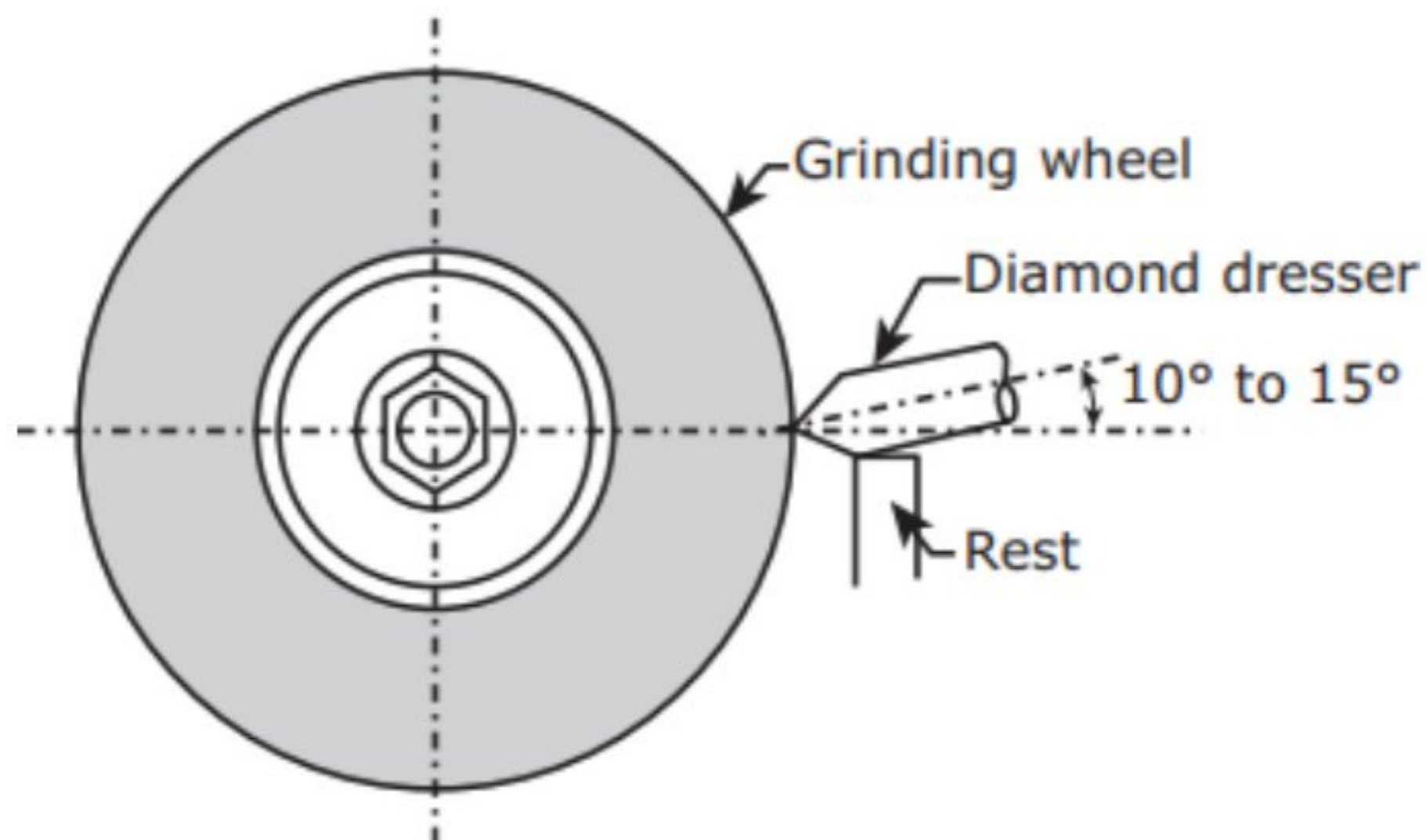
1. Cylindrical grinding machine
2. Internal grinding machine
3. Centreless grinding machine
4. Surface grinding machine
5. Tool and cutter grinding machine
6. Special grinding machine

2. A grinding wheel is specified as follows WA46K5V17. Explain the meaning of each symbol.

- W - Manufacturer's abrasive symbol
 A - Types of abrasive - Aluminium Oxide
 46 - Size of abrasive - Medium
 K - Grade of bond - Medium
 5 - Structure of grinding wheel - Dense
 V - Type of bond - Vitrified
 17 - Manufacturer's symbol

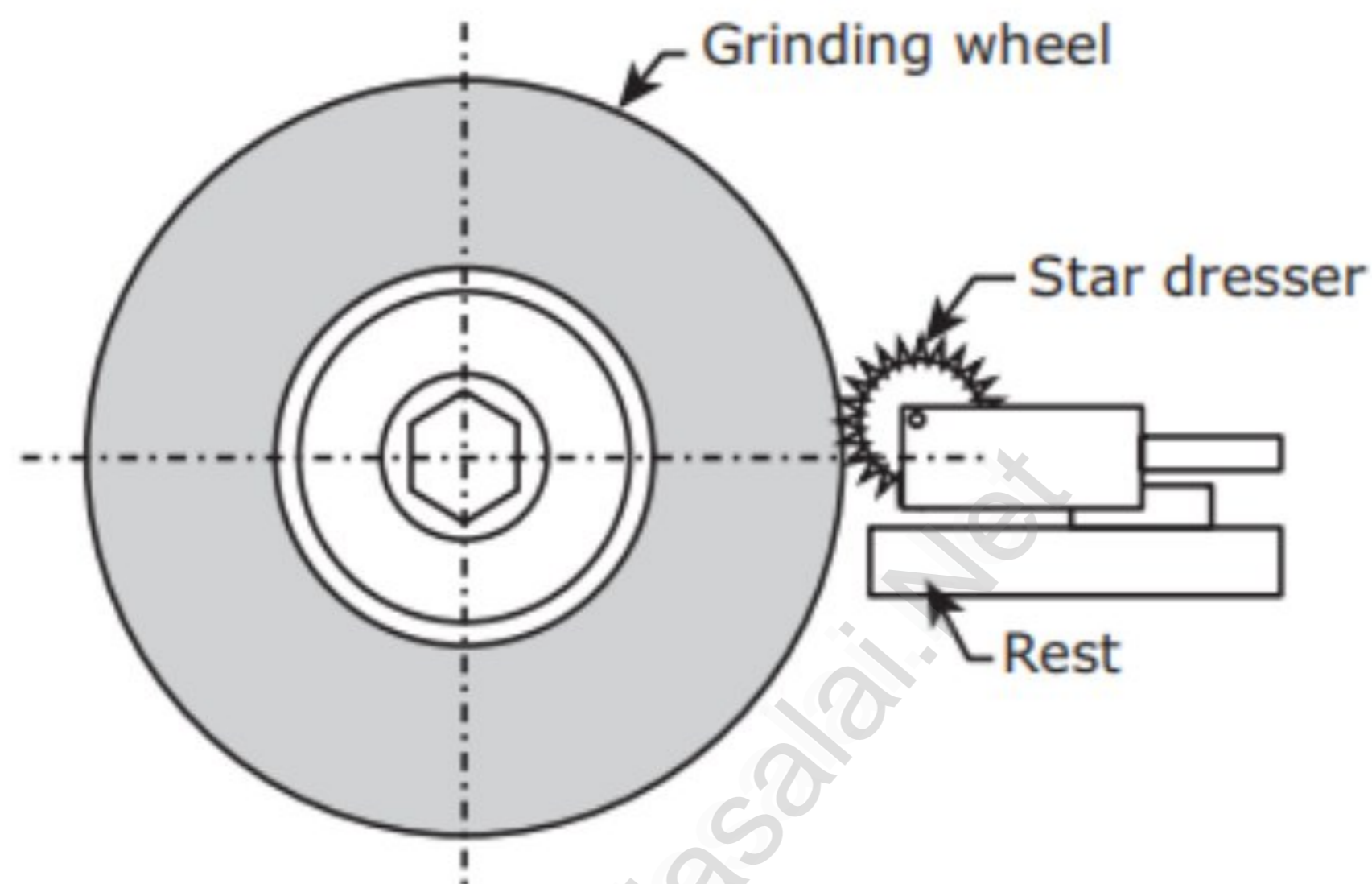
3. Explain with neat sketch of "Truing of a grinding wheel".

The grinding wheel becomes worn from its original shape because of breaking away of the abrasive and bond. Sometimes the shape of the wheel is required to be changed for form grinding. For these purpose the shape of the wheel is corrected by means of diamond tool dressers. This is known as truing of grinding wheels.

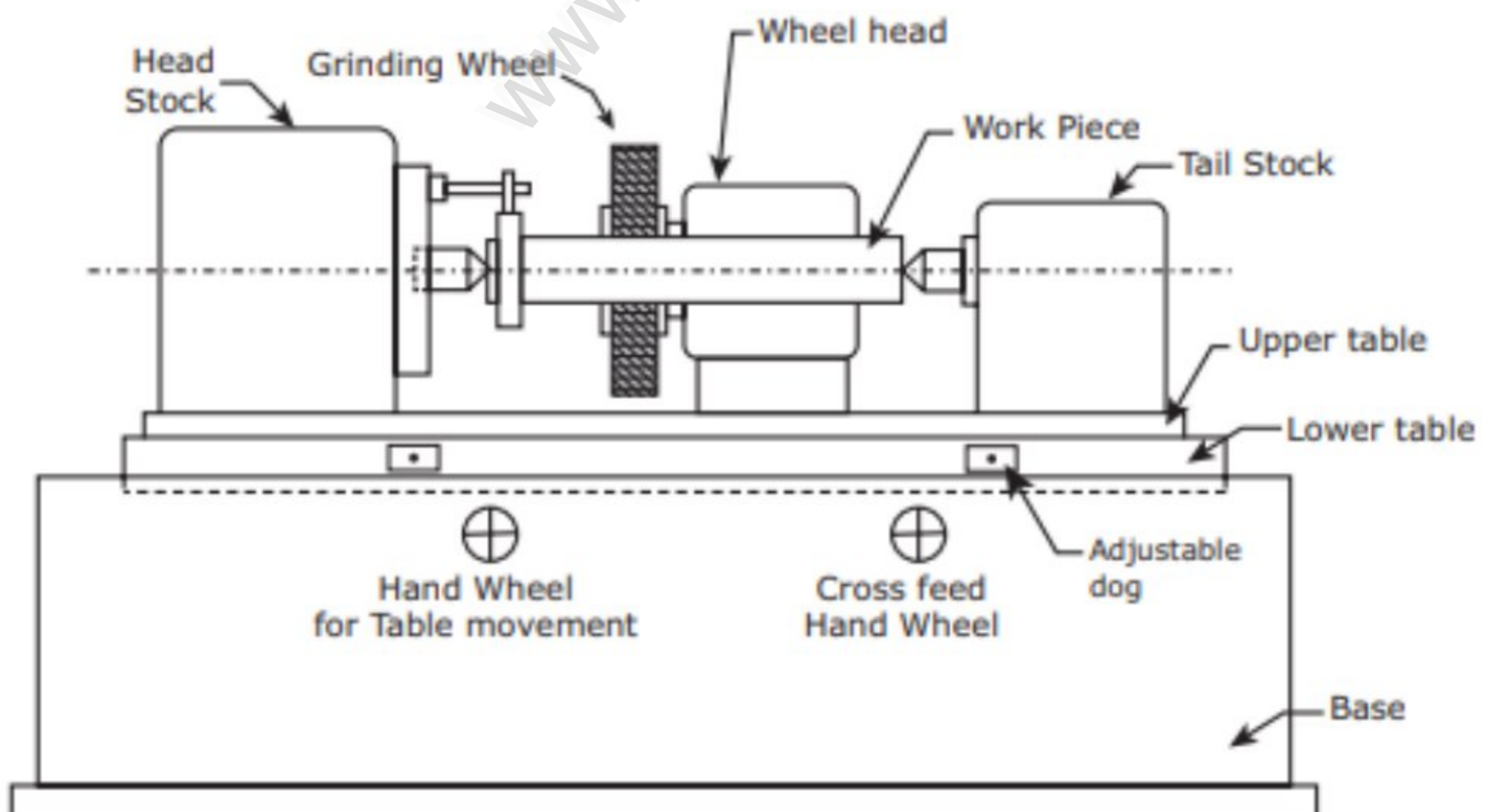


4. Explain "Dressing" of a grinding wheel with a diagram.

Dressing is the purpose of breaking away the glazed surface so that sharp particles are again presented to the work. The common types of wheel dresser known as star-dressers or diamond tool dressers. soft bonds are the remedies. The glazed wheels are dressed to have fresh, sharp cutting edges.



1. Sketch and explain important parts of an external cylindrical grinder.



The machine which is used to grind external surface like cylindrical and taper surfaces is called external cylindrical grinding machine.

Base

The base is made of cast iron and rest on the floor. It supports all other parts of the grinder. The top of the base is accurately machined and provides guideways for the table to slide on.

Tables

The tables are mounted on top of the base. There are two tables namely upper table and lower table. The lower table slides on the guideways on the bed. Table can be moved by hand or power

Head stocks

The head stock is situated at the left side of the upper table. It supports the workpiece by means of a centre and drives it by means of a dog.

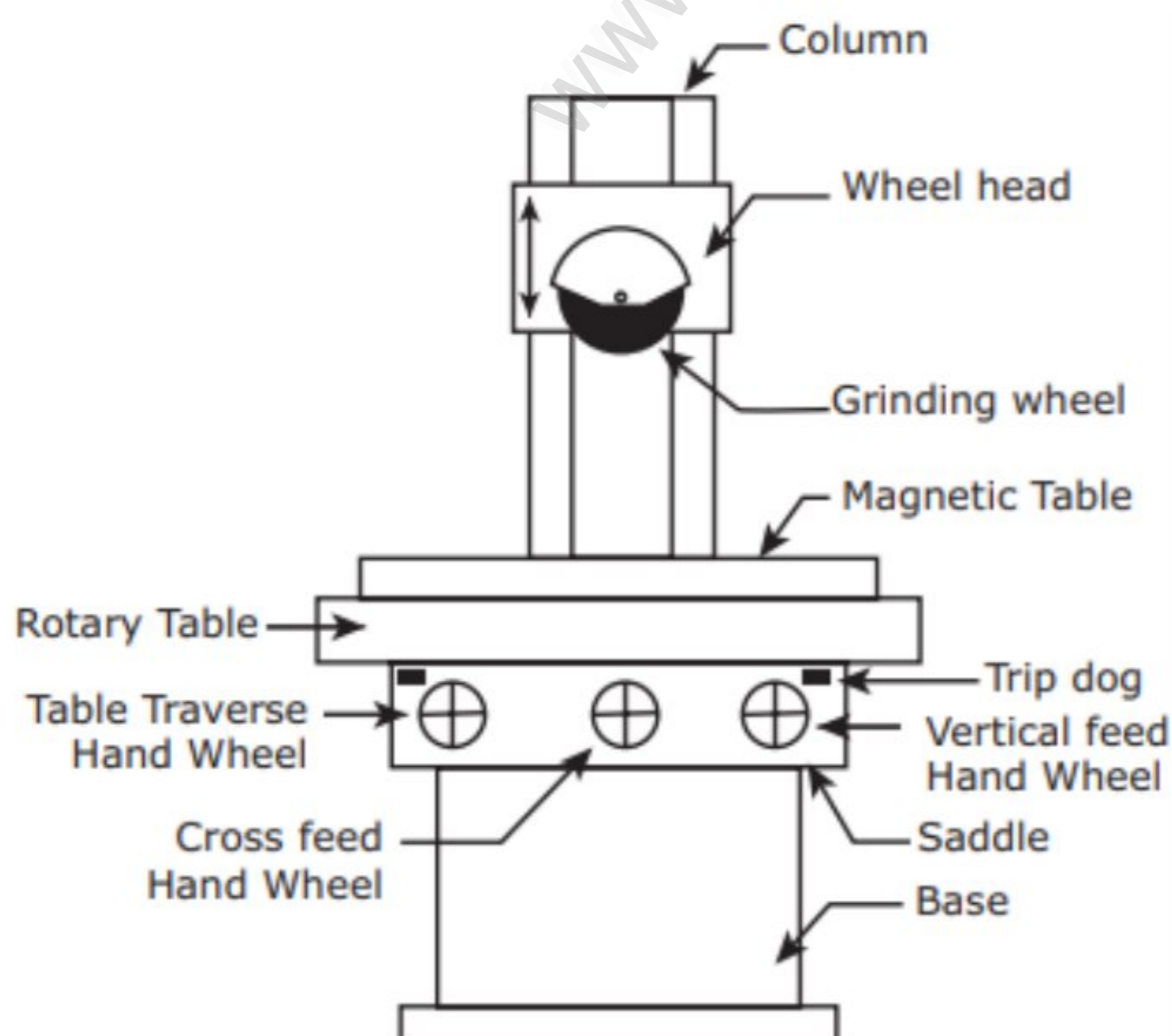
Tailstock

The tailstock is situated at the right side of the table. It can be adjusted and clamped in various positions to accommodate different lengths of workpieces.

Wheel head

The wheel head is placed over the bed at its back side. The wheel head may be moved at right angles to the table guideways.

2. Sketch and explain a surface grinder.



Base

The base is made of cast iron. It is a box like casting which houses all the table drive mechanisms.

Saddle

Saddle is mounted on the guideways provided on the top of the base. It can be moved across towards or away from the column.

Table

The table is fitted carefully in the machined guideways of the saddle. It reciprocates along the guideways to provide the longitudinal feed.

Wheel head

An electric motor is fitted on the wheel head to drive the grinding wheel. The wheel head is mounted on the guideways of the column which is secured to the base.

3. Explain 'mounting' of a grinding wheel with a suitable diagram.

Great care must be taken in mounting the grinding wheel on the spindle. The following points are important in connection with mounting of grinding wheel.

1. All wheels should be inspected before mounting to make sure that they have not damaged. The wheel is put on an arbor and is subjected to slight hammer blows. A clear, ringing, vibrating sound must be heard. This test is applicable to vitrified and silicate wheels
2. The grinding wheel should not be forced on the spindle and they should have an easy fit on the spindle.
3. The length of the lead bush should not be more than the width of the wheel face.
4. Flanges of equal diameter are fitted at both sides of the wheel. The flange diameter should enough be to hold the grinding wheel conveniently. Atleast the flange diameter must be equal to the half of the grinding wheel diameter.
5. The sides of the wheel and the flanges should be flat. Flanges contact the wheel only with the angular clamping area.
6. Washers of compressible materials such as cardboard, leather, rubber etc. not over 1.5 mm thick should be fitted between the wheel and its

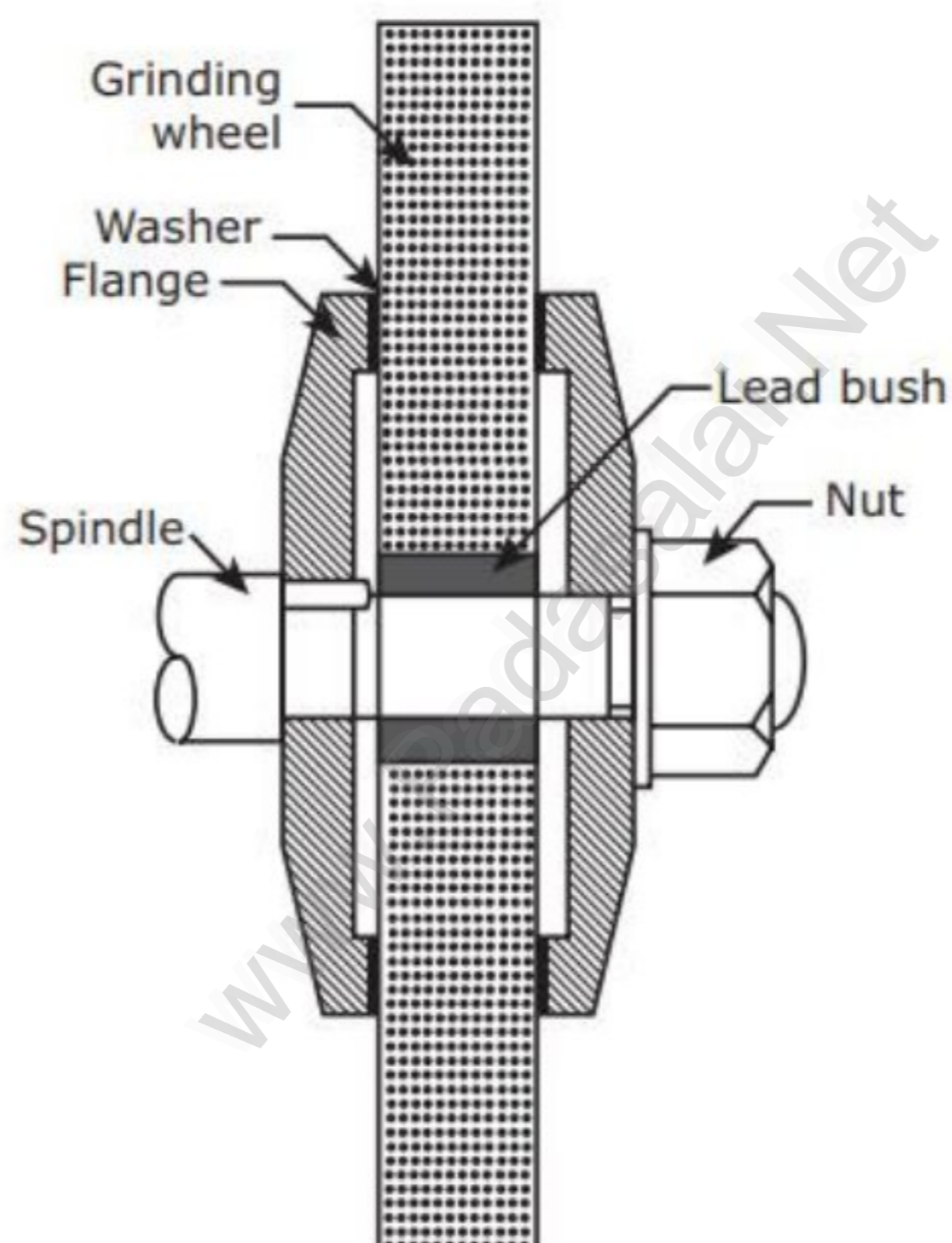
flanges. The diameter of washers may be normally equal to the diameter of the flanges.

7. The inner flange should be keyed to the spindle, whereas the outer flange should have an easy sliding fit with the spindle.

8. The nut should be tightened to hold the wheel firmly.

9. Wheel guards should be fitted at required place before starting the grinding machine.

10. After mounting the grinding wheel, the wheel should be made to run idle for a period of about 10 to 15 minutes, grinding wheels must be dressed and trued before any work can be started.



5. MILLING MACHINE

1. Milling machine was developed by
 - a. Henry Maudslay
 - b. **Eli Whitney**
 - c. James Nasmyth
 - d. Michael Faraday
2. In a milling machine, cutters are mounted on
 - a. Column
 - b. Table
 - c. Over hanging arm
 - d. **Arbor**
3. The distance of table-travel is controlled by
 - a. Saddle
 - b. **Trip dogs**
 - c. Cross Feed Rod
 - d. Vertical feed Rod
4. The tool used for cutting reamer teeth
 - a. Slitting saw
 - b. End mill Cutters
 - c. **Angle Milling Cutters**
 - d. Form cutter
5. The cutter used for cutting grooves and key ways
 - a. Slitting saw
 - b. **End mill Cutters**
 - c. Angle Milling Cutters
 - d. Form cutter

3 MARKS

1. 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.

2. Name the fundamental milling process?

1. Peripheral milling
2. Face milling

3. What are the types of peripheral milling?

1. Up milling
2. Down milling.

4. Name any three work holding devices in a milling machine?

1. T' -bolts and clamps.
2. 'V' - blocks
3. Angle plate
4. Vise

5. What are several methods of holding milling cutters on the machine spindle?

1. Arbor 2. Collet 3. Adapter 4. Screwed on cutters

6. Write three different types of arbor.

1. Pilot end arbor, 2. Plain arbor 3. Stub arbor.

7. When will you use the Collet in milling machine?

Collet is used for holding straight shank milling cutters, End milling cutters and woodruff key cutters.

8. What is the use of plain milling cutter?

To produce flat and horizontal surfaces.

9. What is the use of side and face milling cutter?

To produce slots, grooves

10. What is the use of angular milling cutter?

To produce angular surface. It cuts 'V'- grooves, Reamer teeth, cutters teeth.

5 MARKS

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

S.No.	Plain milling machine	Universal milling machine
1.	The table can be moved vertically, longitudinally and crosswise.	Apart from the three movements of a plain milling machine. It can be swivelled about 45°.
2.	Helical milling works cannot be done as the table cannot be swivelled.	The table can be swivelled and helical milling and spiral milling can be performed.
3.	As there are no special attachments, operations like gear cutting, slotting and vertical milling operation cannot be performed.	Special attachments like indexing head, rotary table, vertical milling attachment, slotting head are available with this machine.
4.	It is more rigid and suitable for machining on heavy and large workpiece and for simple milling operations.	It is meant for light workpieces, a wide range of operations can be performed in this machine. It is mainly used in tool rooms.
5.	The cost is less.	It is very costly.

2. What are the types of milling machine?

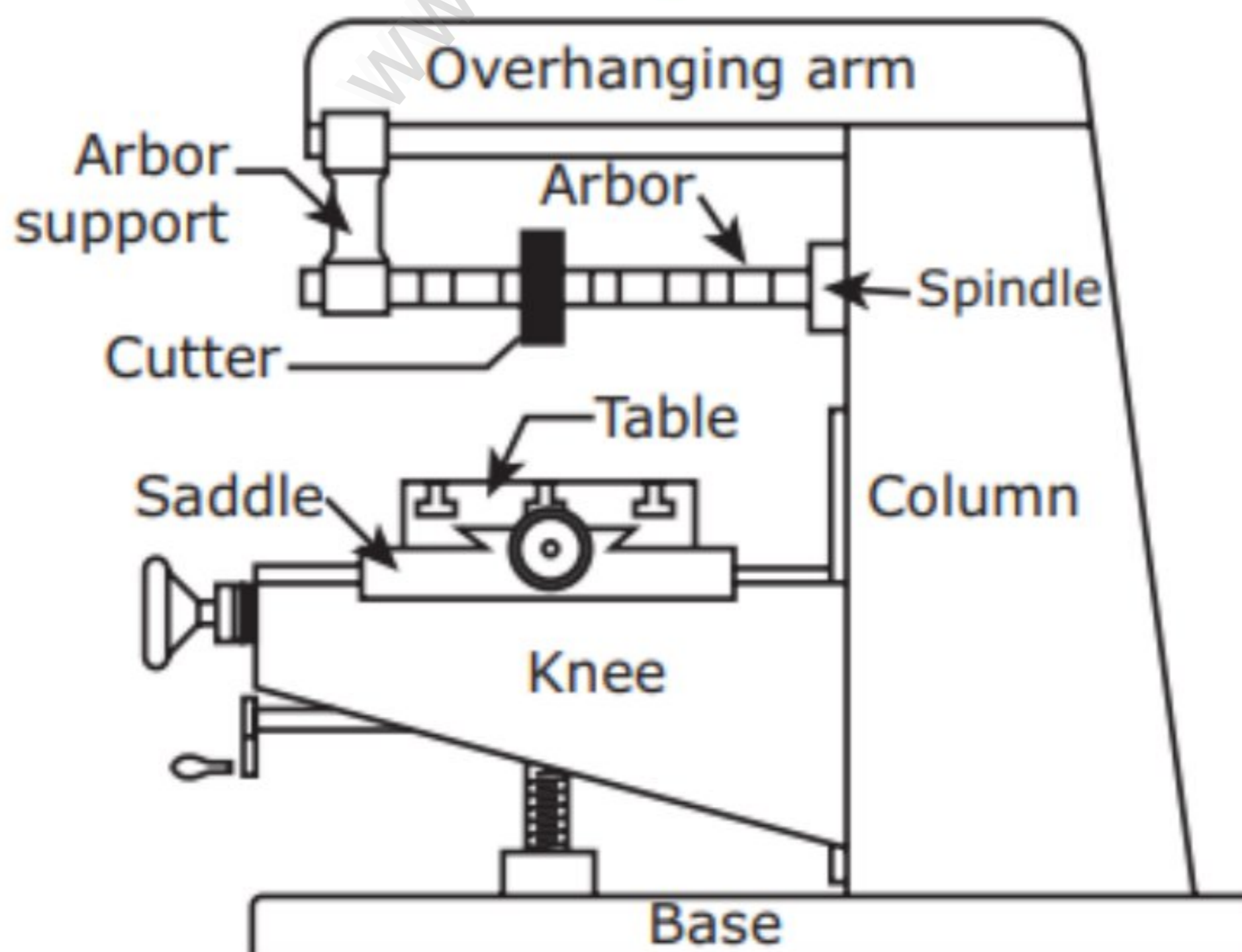
1. Column and knee type
 - a. Plain milling machine
 - b. Universal milling machine
 - c. Omniversal milling Machine
 - d. Vertical milling machine
2. Table types milling machine
3. Planer type milling machine
4. Special type milling machine

3. List out various types of milling cutters.

1. Plain milling cutter
2. Slitting saw
3. Side and Face Milling Cutter
4. End mill Cutters
5. Angle Milling Cutters
6. Form cutter
7. 'T' - Slot milling cutter.

10 MARKS

1. Draw a neat diagram of a milling machine and explain its construction.



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 it is box shaped. It houses the mechanism for providing drive for the spindle.

Knee

It slides up and down on the guide ways of 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.

Table

The table is moved longitudinally either by power or manually on the guideways of the saddle. Top of the table is accurately machined and T-slots are cut for holding the work and other special fixtures on it.

Spindle

It is located in the upper part of the column. It receives power from the motor through belt, gears and clutches.

Overarm

It supports the arbor from the top of the column. The arbor is supported by the bearing fitted within the arbor support.

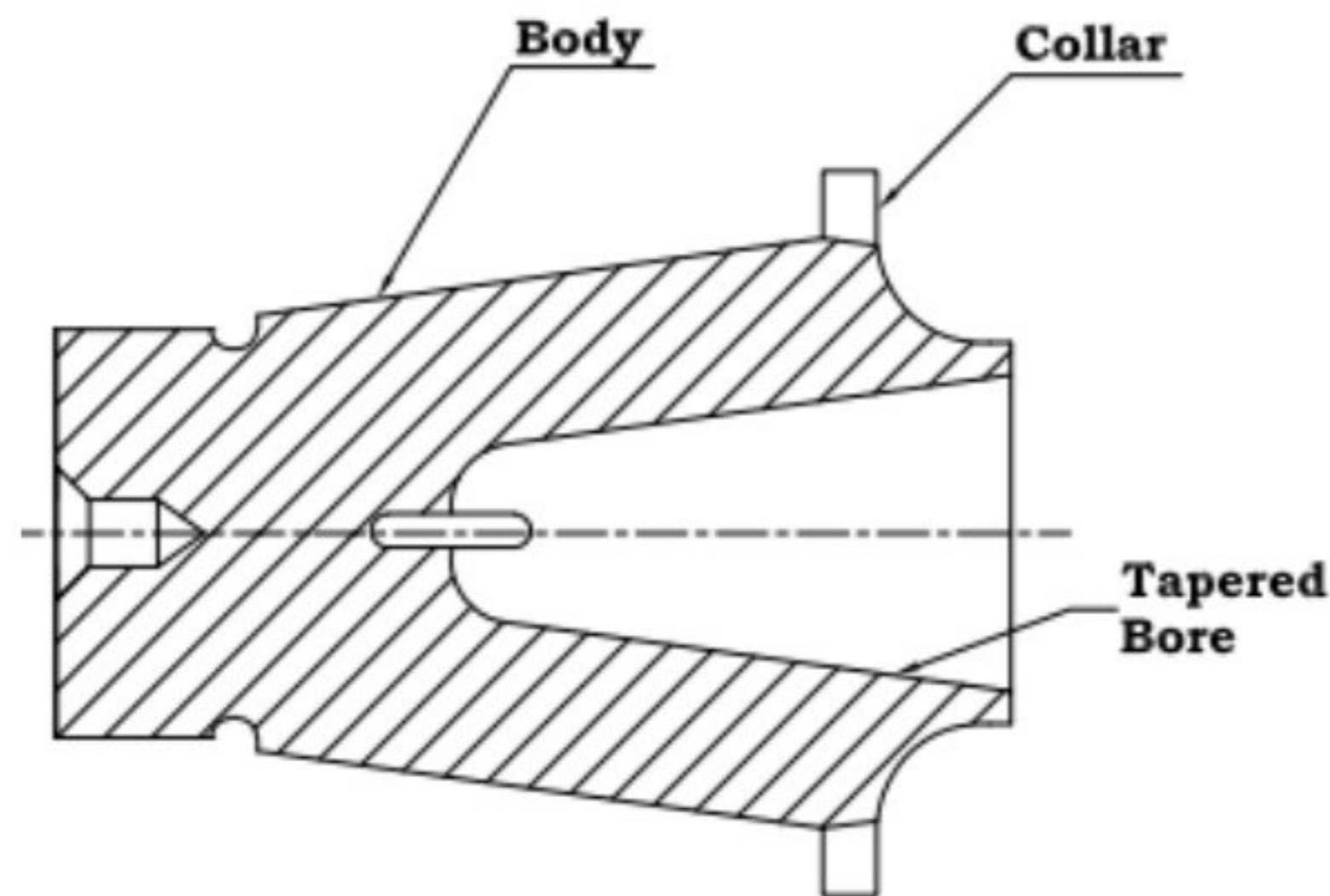
Arbor

It supports the different types of cutters used in the machine. It is drawn into the taper hole of the spindle by a draw bolt.

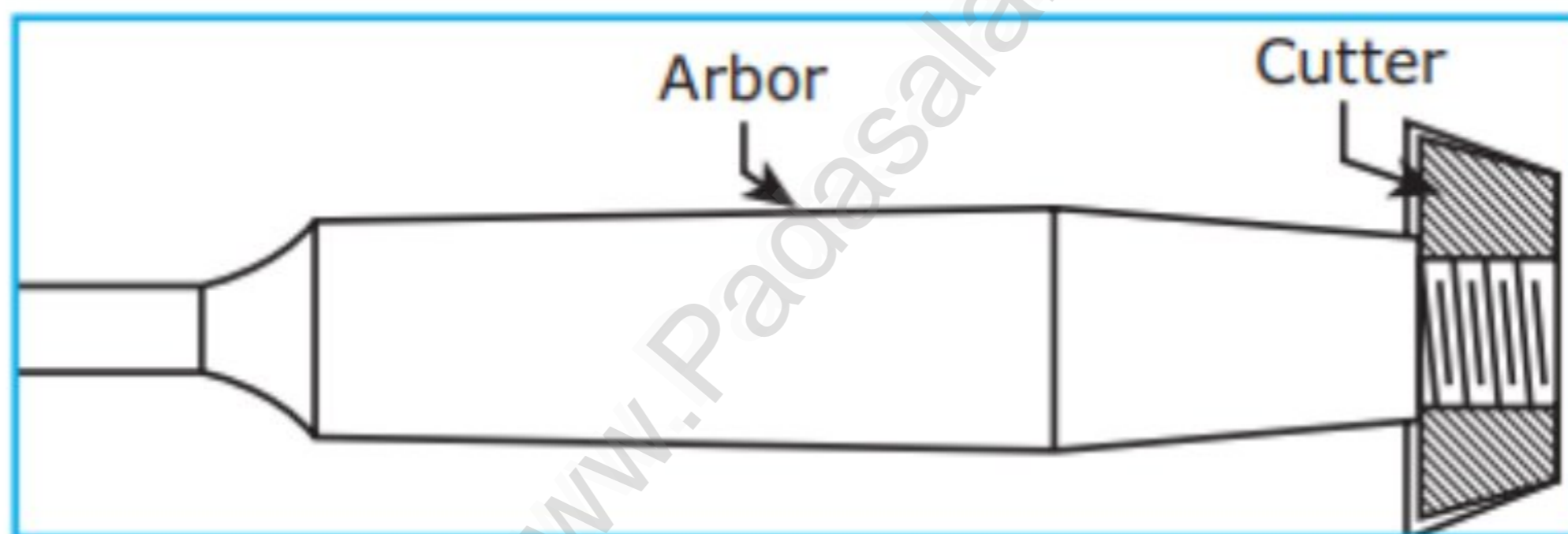
2. What are the differences between a up milling and a down milling?

S.No.	Up Milling	Down Milling
1	Work piece mounted on the table is fed against the direction of rotation of the milling cutter.	The work piece mounted on the table is fed in the same directions as that of the rotation of the milling cutter
2	Cutting force is minimum during the beginning of the cut and maximum at the end of cut.	Cutting force is maximum during the beginning of the cut and minimum at the end of cut
3	Thickness of chip is more at the end of the cut.	Thickness of chip is more at the beginning of the cut.
4	The cutting force of the teeth is upward. So, it will try to lift the work piece from the fixture.	The cutting force of the teeth press the work piece downward. So, it helps holding of the work piece firmly.
5	The fixture design is difficult	The fixture design is simple
6	Applying the coolant at the cutting edge is difficult.	Applying the coolant at the cutting edge is effectively applied.
7	The chips accumulate at the cutting zone. So chips interfere with the cutting action.	The chips disposed off from the cutting zone. So chips do not interfere with the cutting action.
8	The chip removal is difficult	The chip removal is easy
9	The machined surface is not very smooth	The machined surface is smooth
10	Up milling is also called conventional milling	Down milling is also called non-conventional milling

3. Explain any two cutter holding devices with diagram.

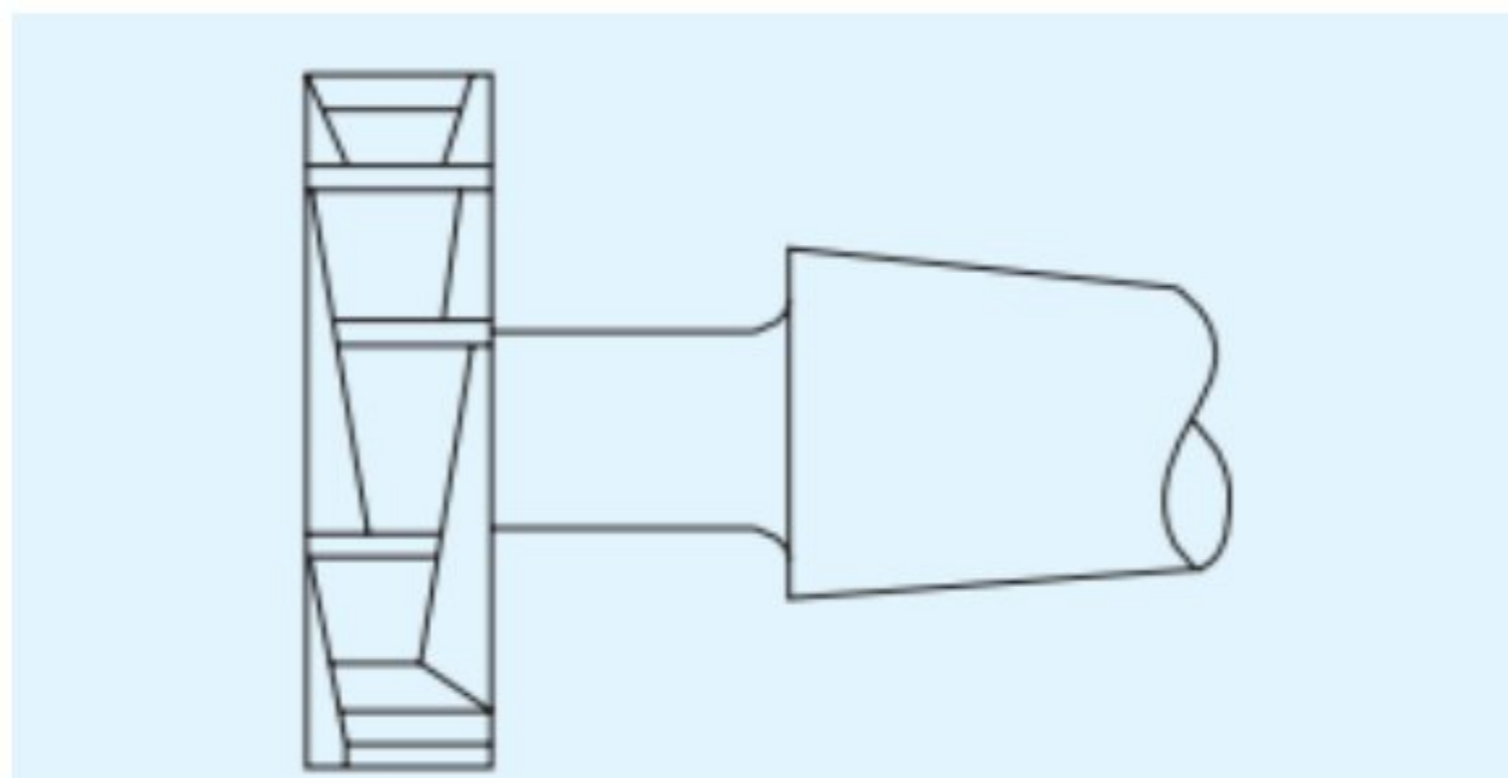


If the taper shank of the cutter is smaller than the spindle nose, the adapter is used. The front portion of the adapter has a taper bore to receive the taper shank of the cutter. The rear end of the adapter has a taper shank. The taper shank is fitted into the spindle nose by draw bolt.

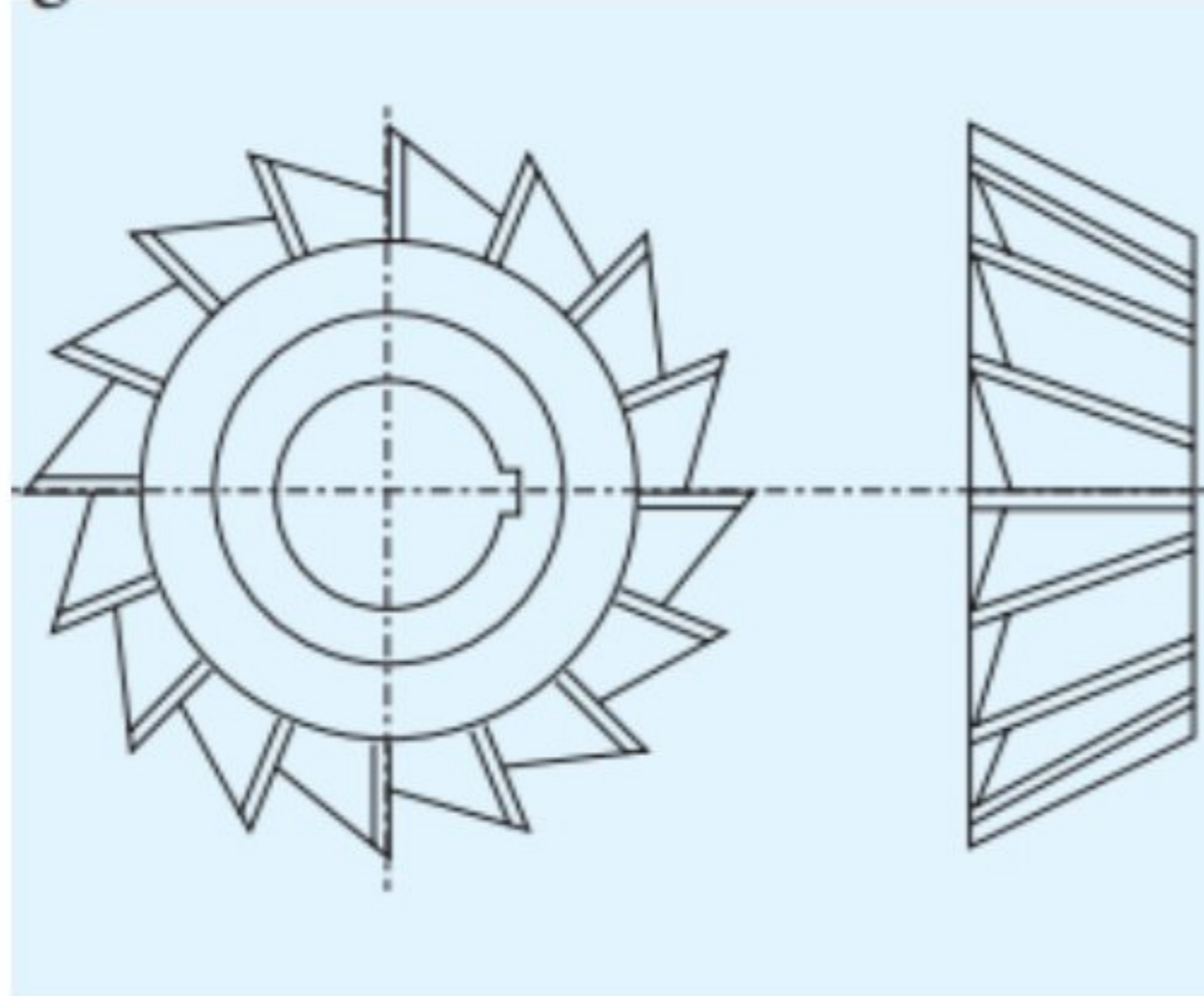


The small cutters having threaded holes at the center are held by screwed arbors. It has a threaded nose at one end and adapters shank at the other end the shank of the arbor is mounted on the spindle.

4. Draw any two types of milling cutters and explain their structure and application.



The teeth are cut on the periphery as well as on both side of the cutter. It is a special form of cutter. To produce "T"- Slots.



The cutting teeth is inclined. It has single or double angles. Cutters are available in standard angle. To produce angular surface. It cuts 'V"- grooves, Reamer teeth, cutters teeth, etc.

6. MACHINE TOOL MAINTENANCE

1. Maintenance done once in a year is _____
 - a) Routine maintenance
 - b) Preventive maintenance
 - c) Breakdown maintenance
 - d) Corrective maintenance**
2. Daily maintenance is _____
 - a) Routine maintenance**
 - b) Preventive maintenance
 - c) Breakdown maintenance
 - d) Corrective maintenance
3. Maintenance of belt, bearing and chain is _____
 - a) Daily maintenance
 - b) weekly maintenance**
 - c) preventive maintenance
 - d) corrective maintenance

3 MARKS

1. Define "Maintenance".

"Prevention is better than cure". With reference to this proverb, the task performed to make the machine tools work perfectly is called 'Maintenance'.

2. What is the objective of maintenance?

The primary objective of the maintenance department is to ensure the machine tools, instruments, tools and accessories in good working condition. It is also necessary to ensure safety to both the machine tools and the operator

3. What do you mean by "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.

4. Define backlash.

Some slackness is observed in holding of parts, meshing gears or bolt and nut assembly. This slackness is known as backlash.

5. 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

6. Name the different types of lubrication.

- Ring lubrication
- Wick Lubrication

Splash Lubrication
Grease Lubrication

7. What are the types of maintenance?

Routine maintenance

- a) Daily maintenance
- b) Weekly maintenance

Preventive maintenance

Breakdown maintenance

Capital repairs or Corrective maintenance.

5 MARKS

1. Explain the "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. Applying oil or grease to the axle shaft of the bullock cart and the cycle wheel, gearbox of automobiles, motor shafts of pumps, fans and sewing machine are some examples of lubrication. Friction occurs as the shafts are rotating and the sliding parts moving on each other. It generates heat and the parts get damaged. In order to keep the machine tools accurate and durable, it is necessary to apply lubricants between mating parts. It will reduce friction and wear is minimized. Lubrication is the nerve centre of machine tool. As it is blood circulation for the human body, lubrication is for the machine tools.

2. What are the parts to be lubricated?

Mechanisms of hydraulic systems

Guideways and sliding parts

Rotating shafts

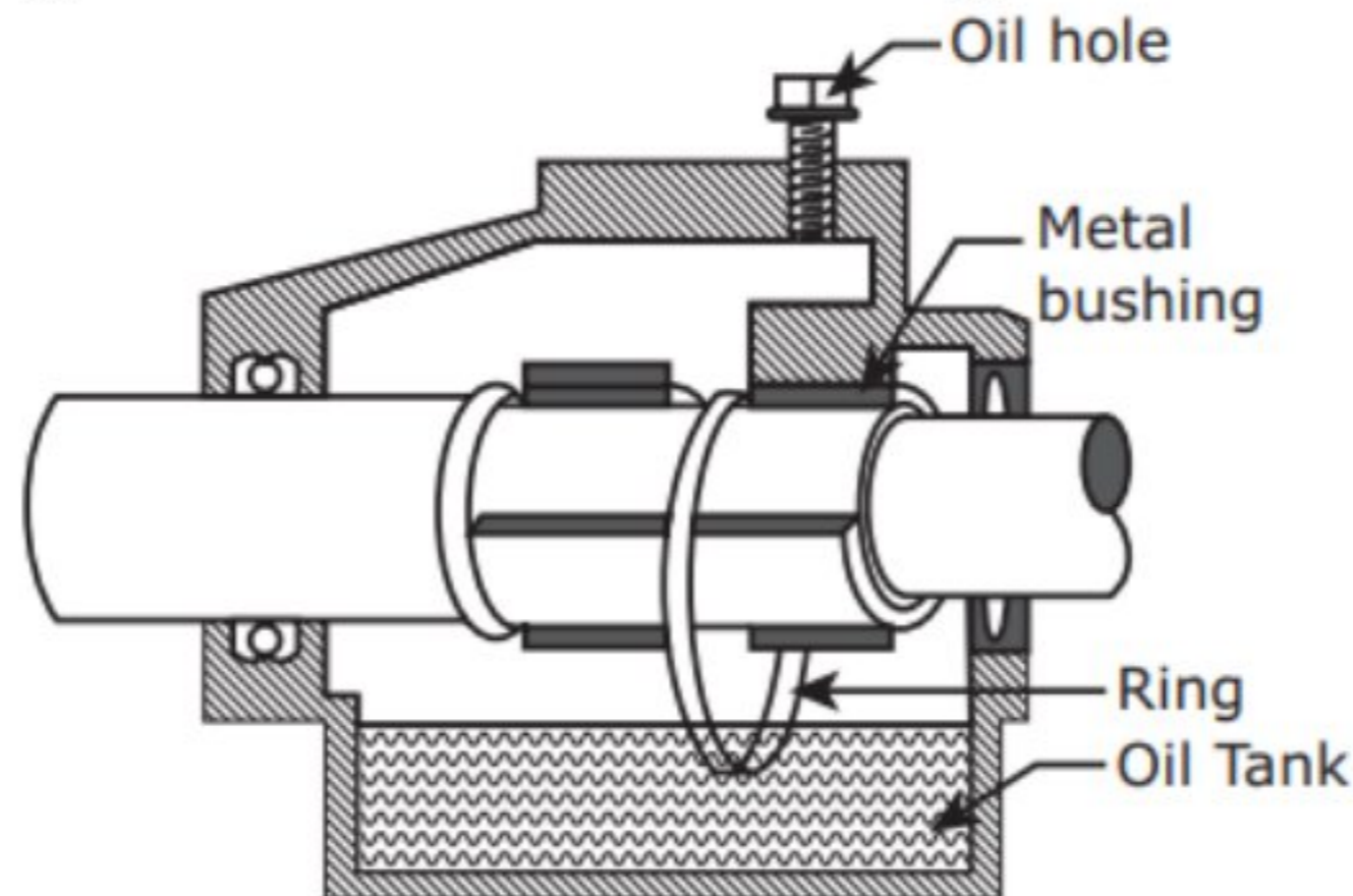
Gear box

Feed Box

Speed changing mechanisms

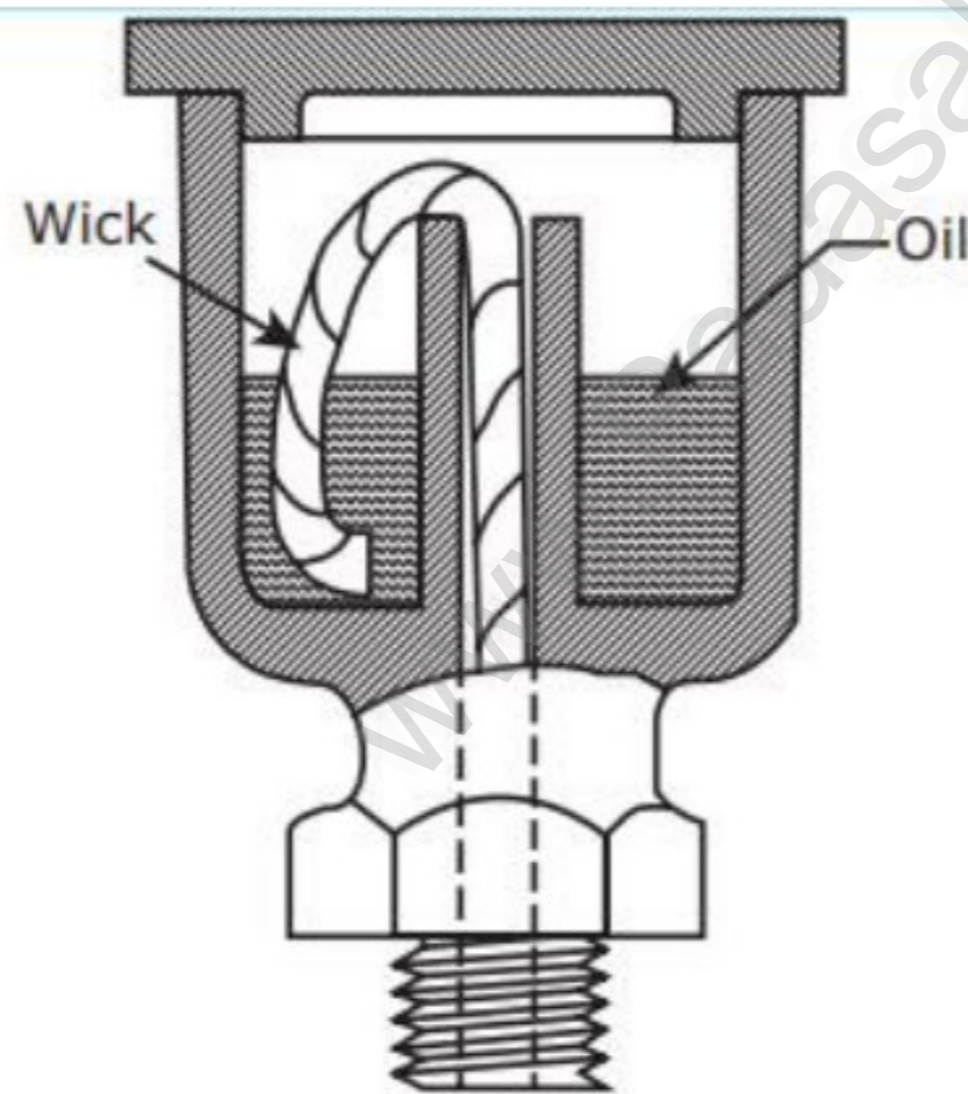
Bearing

3. Explain "Ring Lubrication" with a diagram



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

14. Explain wick lubrication with a neat sketch.

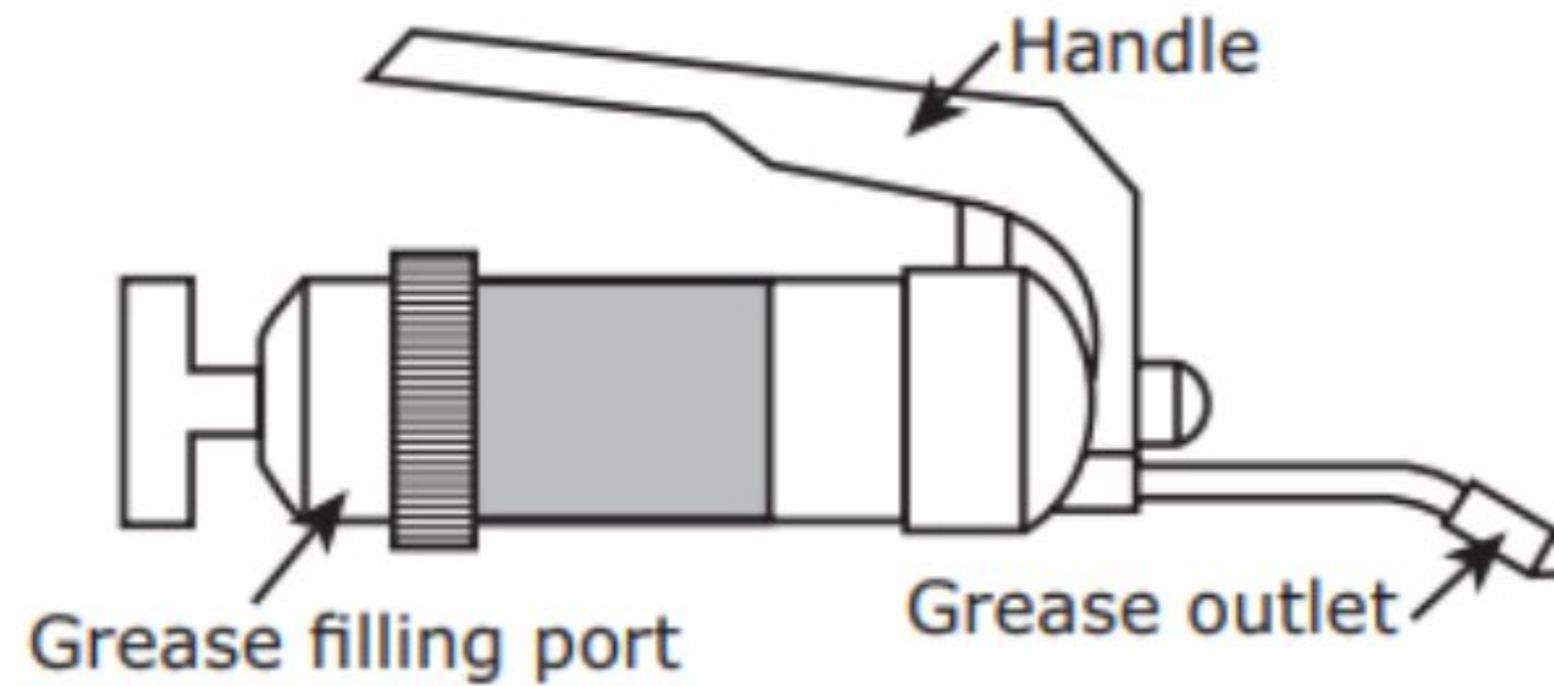


Wick lubrication is a method in which the wick along with a flexible thin piece of metal is used. A container having oil is placed above the bearing. The wick connects the container and the part to be lubricated. This lubrication enables the oil to flow from the container to the required place

15. Explain splash lubrication.

The rotating part of the machine itself is made to be immersed in the oil container. When the part starts rotating, the oil is splashed and the moving parts are lubricated. Bearings are generally lubricated by this method. Little spoons are attached to the rotating parts to get more quantity of oil to the part to be lubricated.

4. Sketch and explain "Grease Lubrication".



Grease lubrication is done with the help of grease guns. Another way of doing it simply is so 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 container

5. Explain Routine Maintenance.

Daily Maintenance

Cleaning all the parts of the machine tool.

Lubricating the movable parts with grease and oil as per requirements.

To correct the machine tool to make it operate accurately.

To look at whether the coolant apply and auto lubricating equipments are working properly.

To remove the burrs cleanly

Weekly Maintenance

The spare parts and integral parts of the machine tools should be cleaned.

The entire workshop premises should be maintained cleanly.

The cables and electrical connections should be checked.

The position and working of belt, chain etc., are checked and adjusted.

Parts like gears, clutches and bearings are checked for their proper functioning.

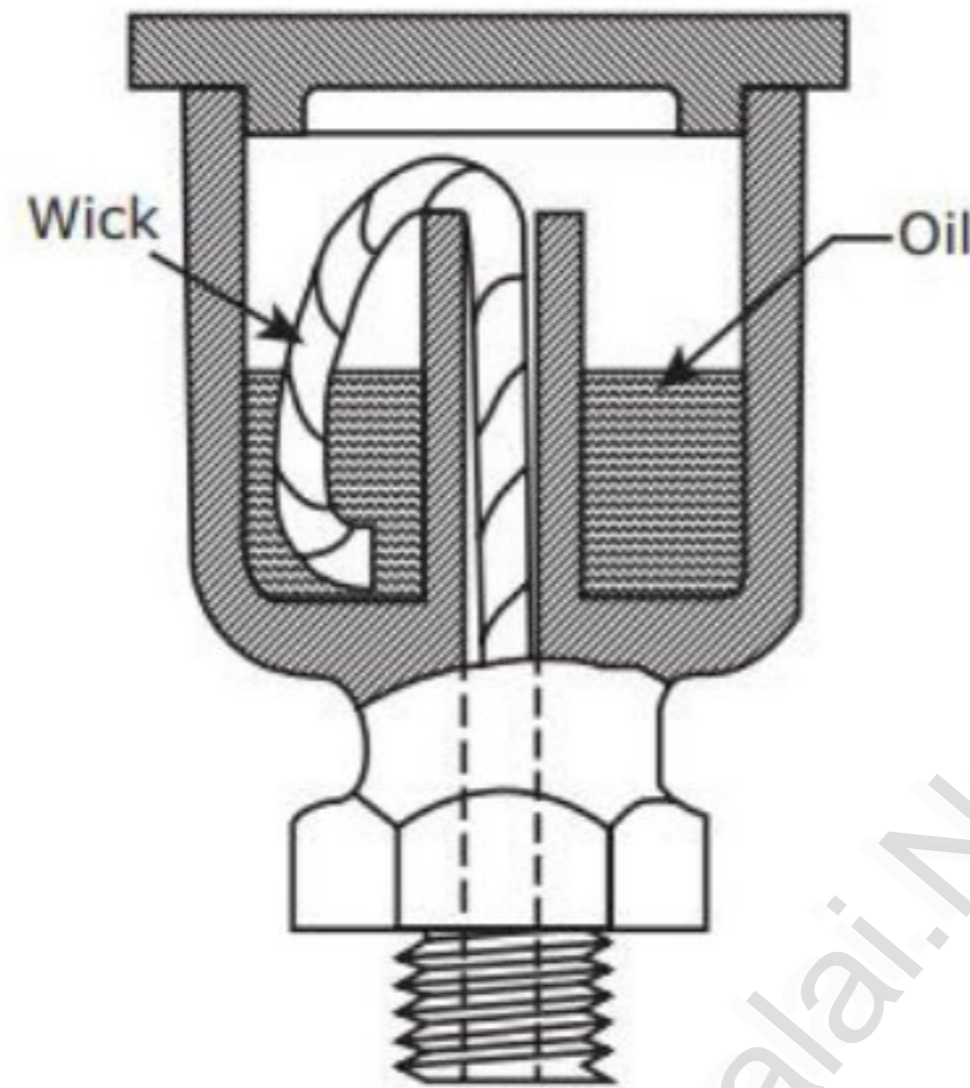
6. Explain corrective maintenance.

Even if the machine is functioning properly, it is necessary to halt the functioning of the machine to do some major repair once in a year. To do that, the machines parts are to be disassembled completely and worn out parts are replaced. Some parts of the machine may be in a condition that they need

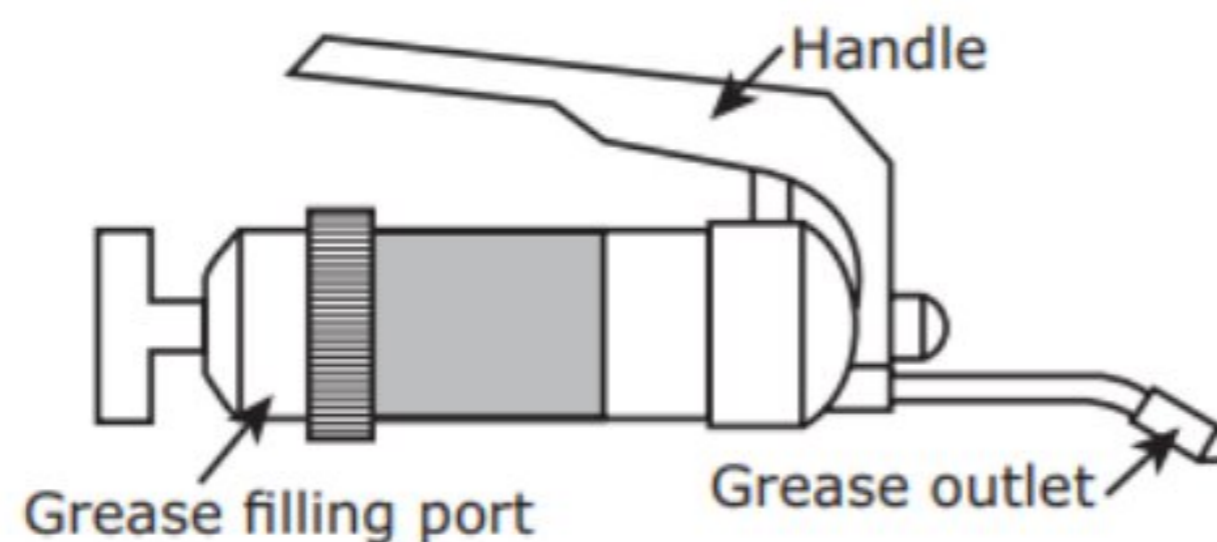
to be replaced soon. To correct all such difficulties, the machine is stopped from functioning to do all and every repairs to bring back the machine to accurate machining conditions. This is called as capital repairs (or) corrective maintenance.

10 MARK

1. Explain any two types of lubrication with diagram.



Wick lubrication is a method in which the wick along with a flexible thin piece of metal is used. A container having oil is placed above the bearing. The wick connects the container and the part to be lubricated. This lubrication enables the oil to flow from the container to the required place



Grease lubrication is done with the help of grease guns. Another way of doing it simply is so 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 container.

2. Explain “Preventive Maintenance”.

In order to avoid sudden breakdown of machine tools and maintenance programme is charted out. This will ensure that there is no slip in the rate of production. In case of any major breakdown to the machine tool, two types of losses are incurred to the management. 1. Direct losses 2. Indirect losses Direct loss is the expenditure incurred for repairing the machine tools and getting them back in action. 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-deliverance of the products to its customers. So, it is necessary to plan the preventive maintenance program to avoid such losses. Even if the machine tools are working in proper conditions, it is better to stop production once in a while to make the necessary repairs and adjustments. Certain parts should be replaced if necessary.

3. Explain “Break down Maintenance”.

Even after enforcing routine maintenance and preventive maintenance, there are chances that some machine parts may fail due to some reason or other. In order to bring back the machine to its original working condition, some minor or major repairs are needed to be done. This type of maintenance is known as breakdown maintenance.

4. Explain “Planned Maintenance Program”.

The planned maintenance programme is to be prepared and executed as follows. 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.
6. The machine should be overhauled if the working efficiency of the machine tool goes below a particular level.
7. The machine tools become very old and not performing to the desired level, it has to be dismantled completely and worn out parts should be replaced to bring it to the normal working condition.
8. The following details should be prepared and made as charts the layout plan of the shop, the size and specification of the machine tools and the parts to be lubricated. The manuals and the list of spare parts of all the machine tools are also to be kept ready.
9. Annual budget for the maintenance work should be prepared atleast six month or once in year in advance.

www.Padasalai.Net

7. WELDING

1. The heat generated during Arc Welding is_____
 - a. 100° C - 150° C
 - b. 50° C - 100° C
 - c. 5000° C - 6000° C**
 - d. 15° C - 200° C
2. The pressure of acetylene in the cylinder of gas welding equipments is_____
 - a. 16kg/cm²**
 - b. 125kg/cm²
 - c. 100kg/cm²
 - d. 14kg/cm²
3. The pressure of oxygen in the cylinder of Gas Welding equipment is
 - a. 16kg/cm²
 - b. 125kg/cm²**
 - c. 100kg/cm²
 - d. 14kg/cm²
4. Plastic Welding is_____
 - a. Pressure Welding**
 - b. Resistance Welding
 - c. Fusion Welding
 - d. Arc. Welding
5. Fusion Welding is_____
 - a. Pressure Welding
 - b. Non - Pressure Welding**
 - c. Resistance Welding
 - d. Thermit Welding

3 MARKS

- 1. Mention any three types of Arc Welding.**
 - a. Carbon arc welding
 - b. Metal Arc welding
 - c. Metal inert gas welding
- 2. State any three types of Gas Welding.**
 - a. Oxy - acetylene welding
 - b. Air - acetylene welding
 - c. Oxy hydrogen welding
- 3. State any three type of welding related process.**
 - a. Oxy - acetylene cutting
 - b. Arc cutting
 - c. Hard facing
 - d. Brazing
 - e. Soldering

4. How is the Welding Electrodes specified?

Generally, the size of the electrodes is specified by the length and its diameter. They are available to a maximum of 12 mm diameter and 45cm length.

5. What are the types of electrodes?

1. Consumable electrode
2. Non – consumable electrode

There are three types of consumable electrodes.

1. Bare electrodes
2. Lightly coated electrodes
3. Heavily coated electrodes

Non – consumable electrodes are used in the processes of atomic hydrogen welding and TIG welding.

6. Name of three types of flames generated in Gas Welding.

1. Neutral flame
2. Carburising flame
3. Oxidising flame

7. What are the types of Welded joints?

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

5 MARKS

1. Explain any two types of equipments used in Gas Welding

1. Gas cylinders
2. Regulators
3. Pressure gauges
4. Rubber hoses
5. Welding torch
6. Safety goggles
7. Gloves
8. Spark lighter
9. Wire brush

Gas Cylinders

Oxygen and acetylene gases are stored in separate cylinders and used for gas welding. The colour of oxygen cylinder is black and the acetylene gas is stored in maroon cylinders. Oxygen is stored at a pressure of 125kg/cm². Acetylene gas is stored at a pressure of 16Kg/cm² in the cylinder

Goggles

Oxy acetylene flame emits ultraviolet and infrared rays. These rays are highly harmful to bare eyes. In order to protect the eyes of the welder, goggles should be used by him.

14. Explain any one type flame obtained in Gas Welding with a diagram.

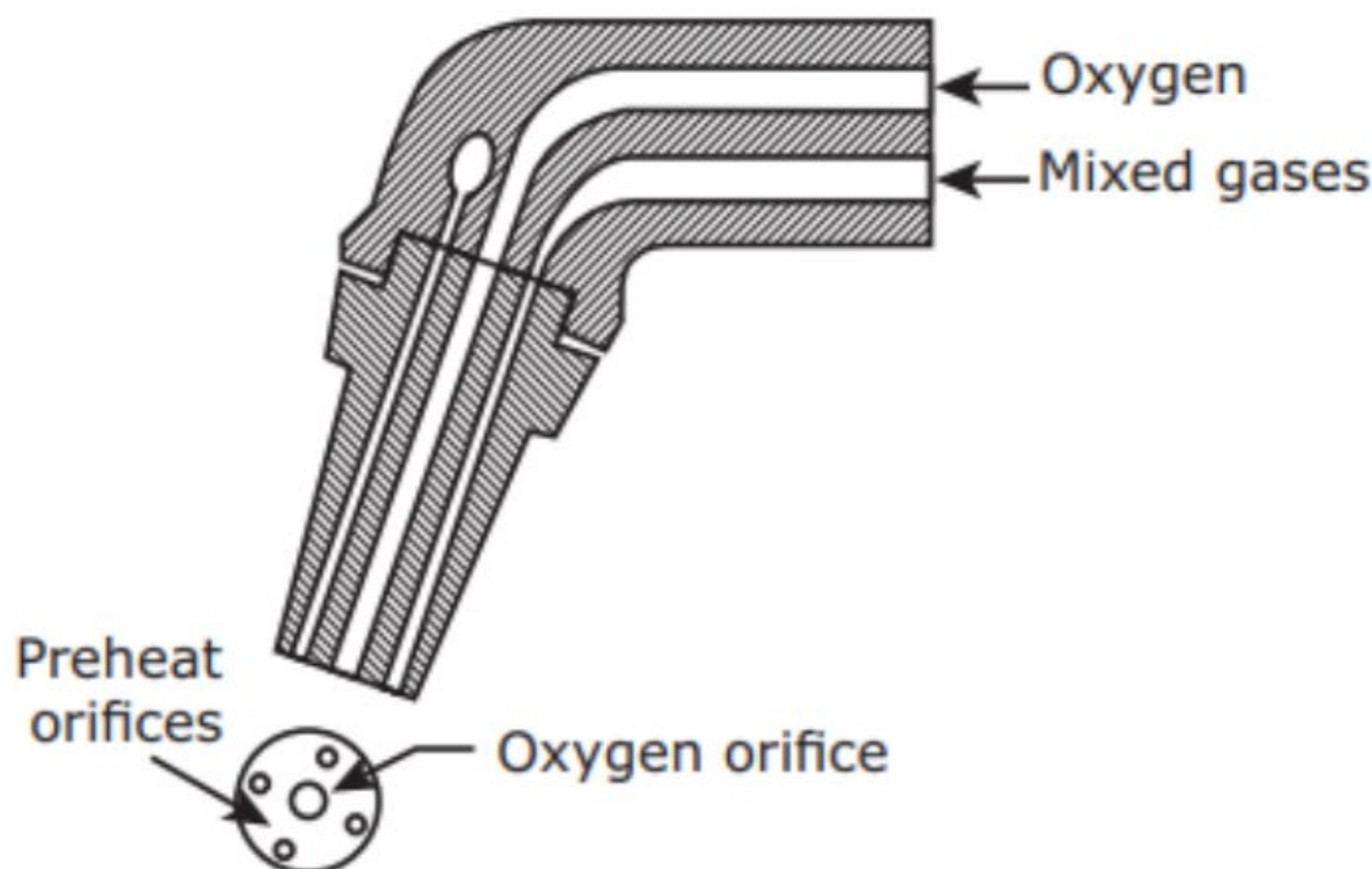
Oxidizing flame is obtained by supplying more oxygen than acetylene. It consists of two zones namely bright inner cone and outer cone. This flame is useful in welding brass and bronze



2. What are the 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

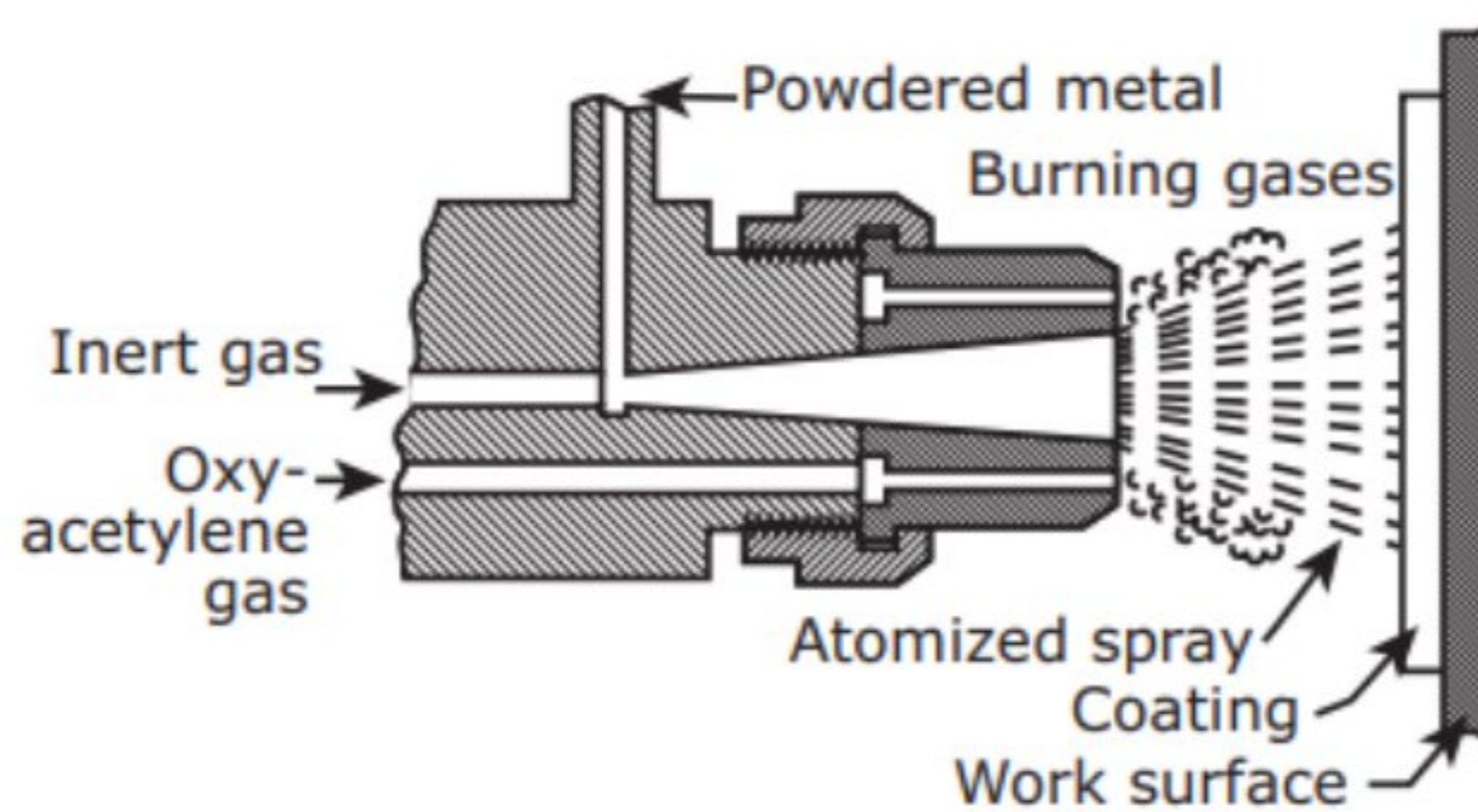
3. Explain the Oxy-Acetylene cutting with diagram.



Plates made of iron and steel are cut by oxygen, acetylene cutting torch. Oxygen and acetylene are mixed in the cutting torch and a gas flame is

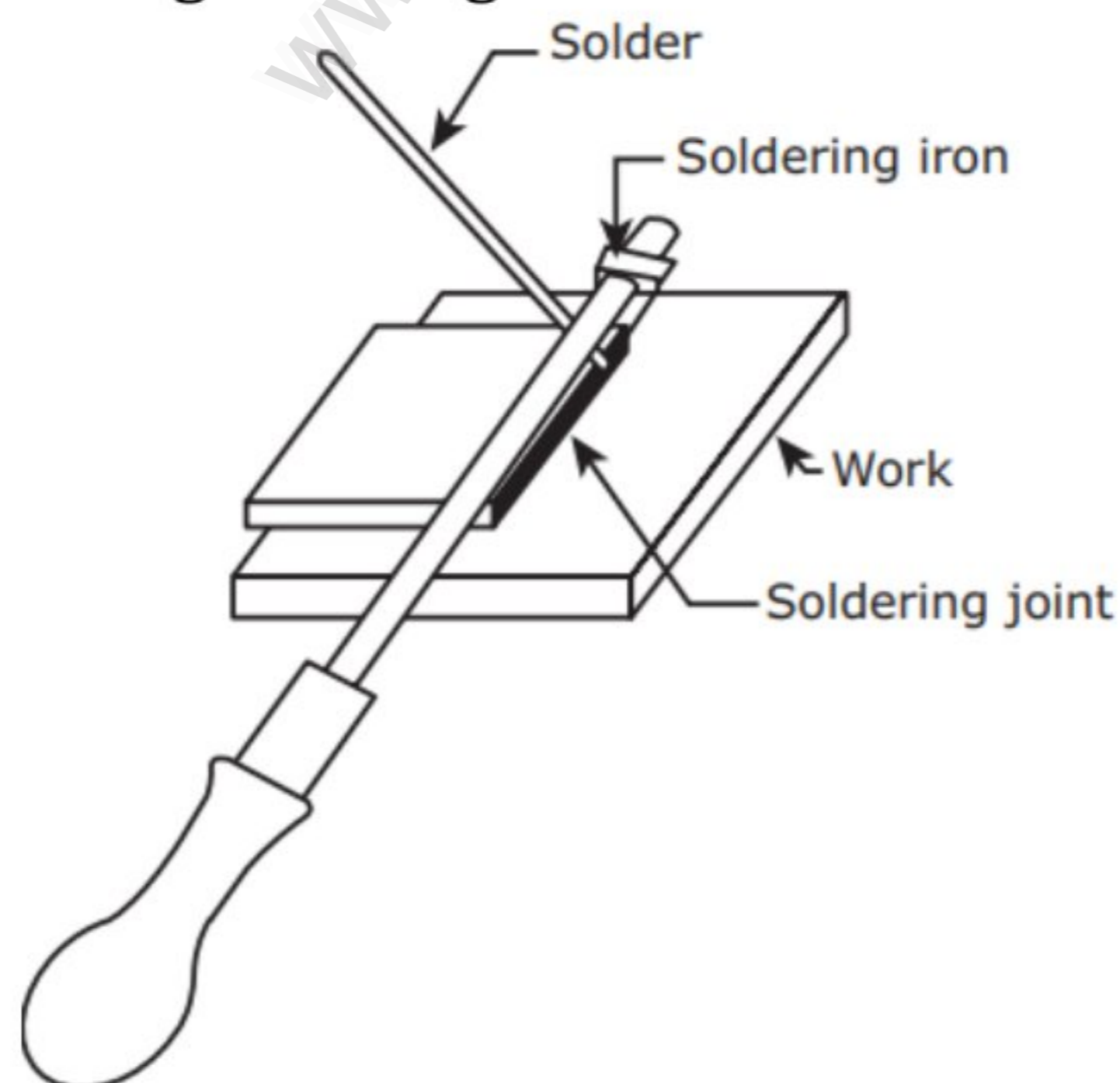
generated. The flame heats the sheets to bring them to red hot condition. High pressure oxygen is supplied on the red hot metal through a separate central hole of the cutting torch. Iron and steel sheets are thus cut by the jet of oxygen.

4. Explain Hard-facing with diagram.



Hard facing is a process of coating a hard material on soft metal parts. Powdered coating metal is filled in the welding gun. The metal powder is melted by the oxy-acetylene gas flame. The supply of inert gas at pressure makes the powdered metal to split into small particles. These particles are sprayed on the surfaces of the soft metal. Coatings of Tungsten carbide, Chromium carbide and Aluminium oxide can be made on the surfaces of different cutting tools and cutters.

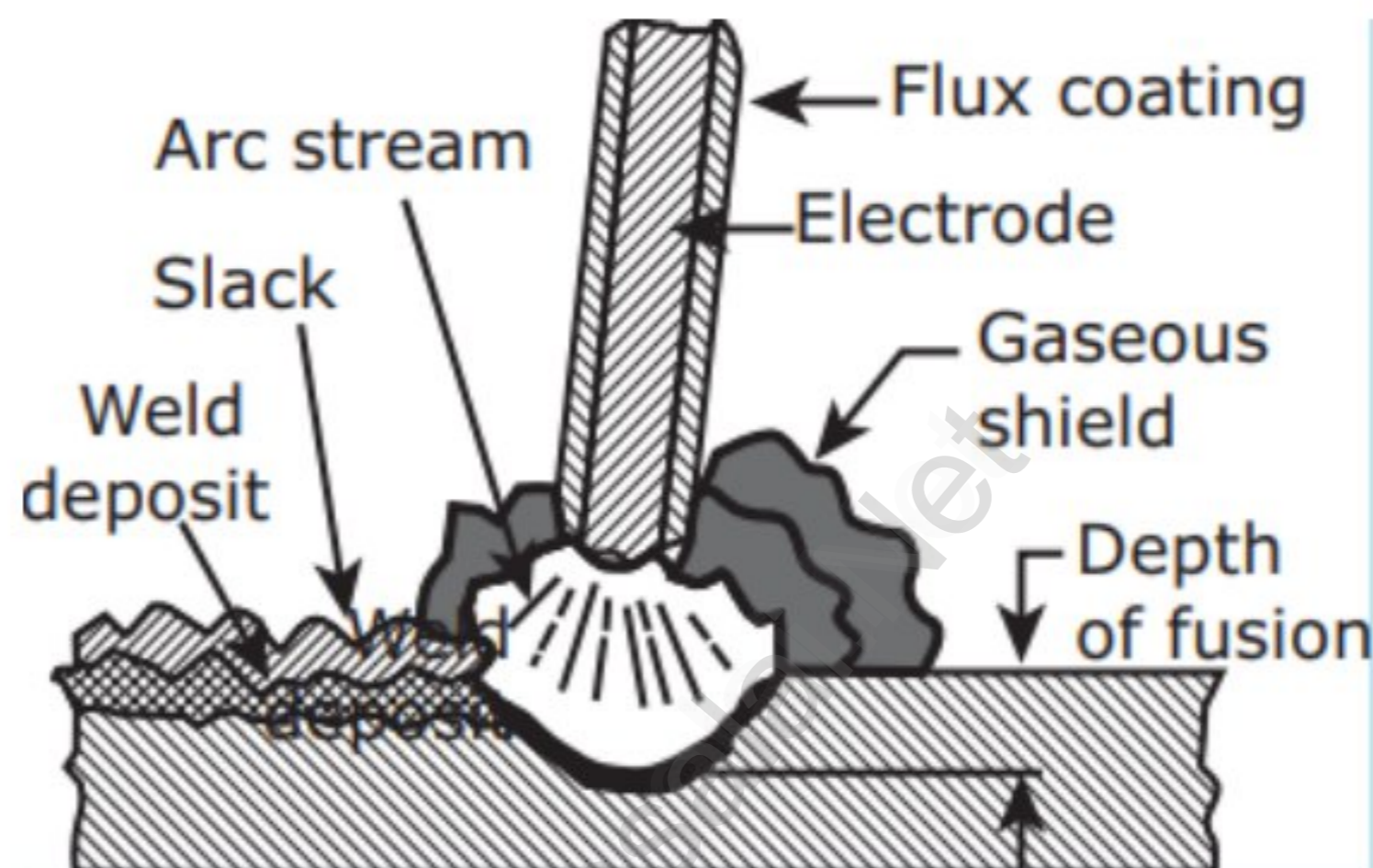
5. Explain Soldering with diagram



Two parts made of similar or dissimilar metals are joined by a solder made of a fusible alloy. Solder is an alloy made of Tin and Lead. The melting temperature of the solder is in the range of 150°C to 350°C. The surfaces of the two metal parts are cleaned and held in correct positions. Flux paste made of zinc chloride is applied on the parts by soldering iron. Application of flux prevents oxidation. The solder is melted by the heat provided by the soldering iron and filled between the metal parts. The solder solidifies and joints the metal parts.

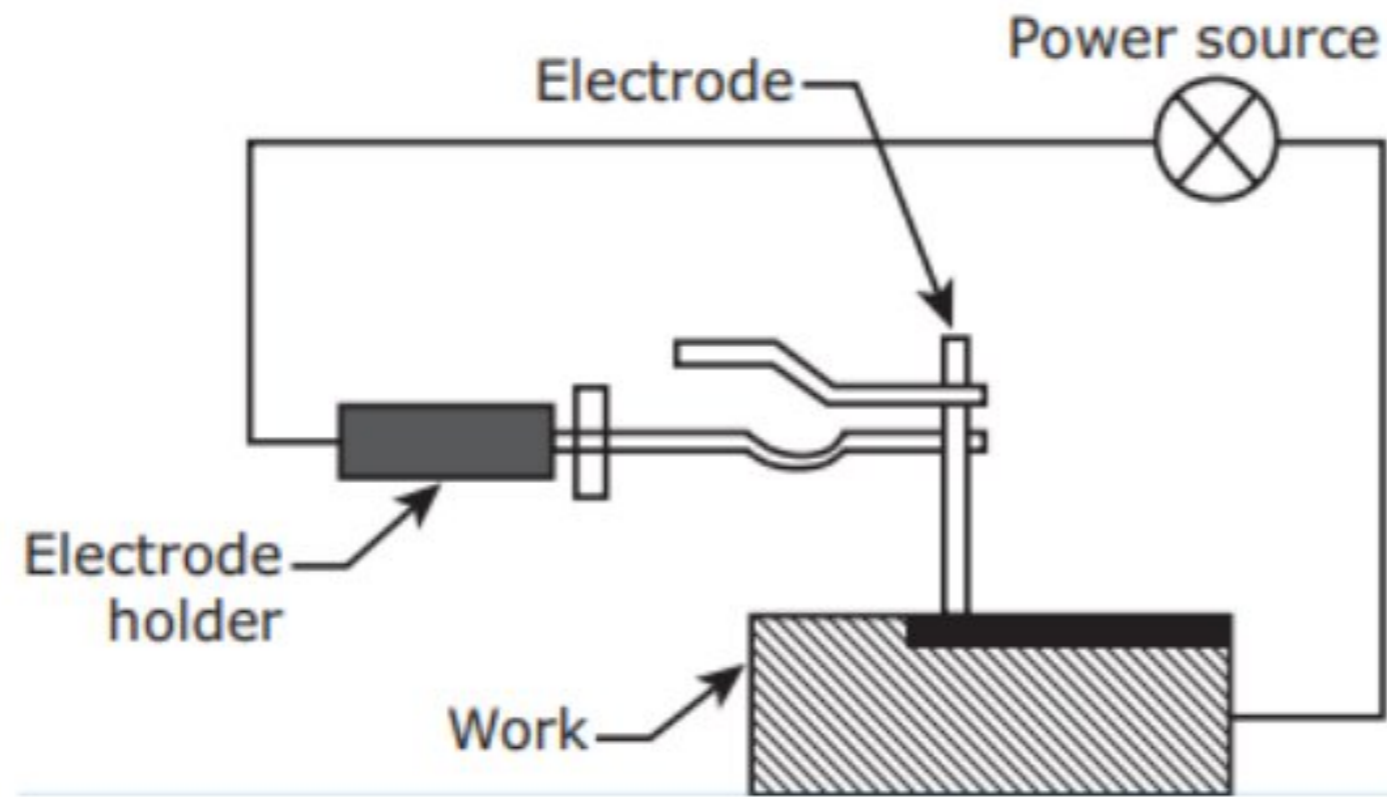
10 MARKS

1. Explain Arc Welding with diagram.



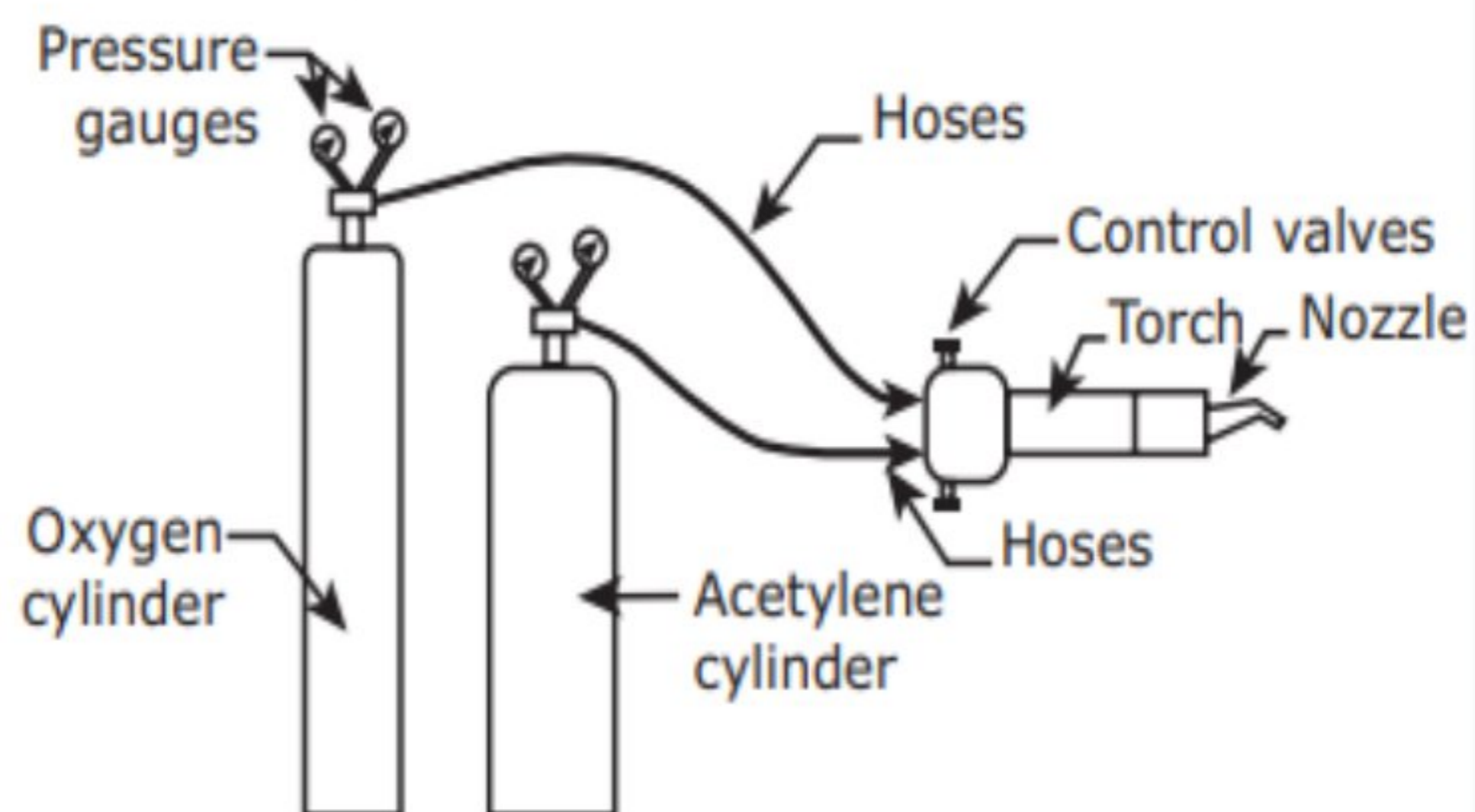
In arc welding, the edges of two metal parts are melted by an electric arc and the joint is made. An electrode made of a suitable metal is utilized for this purpose. The electrode is taken closer to the parts to be joined and electric current is supplied to both the parts and the electrode. An electric arc is made between the electrode and the metal parts. This arc generates high temperature and melts the metal parts. The parts are joined at this molten state. The filler metal in the form of electrode is deposited along the joint. The metal parts are joined without the application of any pressure. Electrical energy is converted into heat energy in arc welding. The distance between the metal parts and the electrode should be around 3mm. The heat generated during arc welding ranges from 50000 C to 60000 C. A generator or a transformer supplies the required current to both the electrode and the metal parts. The electrodes are flux coated to prevent the molten metal from reacting with the atmosphere.

2. List out the Arc Welding equipments with a diagram



1. D.C welding generator (or) AC transformer
2. Cables
3. Electrode cable
4. Work cable
5. Electrode holder
6. Electrode
7. Gloves
8. Protective shield (or) Goggles
9. Apron for the operator
10. Wire brush
11. Chipping hammer
21. Explain Gas Welding with a neat sketch.

3. Explain Gas Welding with a neat sketch.



Gas welding is the process of melting and joining metal parts by means of a gas flame. Generally pressure is not applied during the process of gas welding. Oxygen and acetylene gases are made to pass through the welding torch. These gases are mixed at the required ratio at the torch and the tip of the welding torch is ignited to produce the flame. Because of the heat generated by the flame, the edges of the metal parts are melted. Filler rod provides the additional metal required for making the joint. The flux coated on the electrodes prevents oxidation and removes impurities. This method is suitable in welding metal parts of thickness varying from 2mm to 50mm. The temperature of the flame is around 32000 C.

4. List out the differences between arc and Gas Welding.

Arc welding	Gas welding
The heat is generated by the electric arc	The required heat is provided by the gas flame.
The working temperature is about 4000°C	The temperature of the gas flame is about 3200°C
The filler rod is used as electrode.	Filler rod is used separately
Care should be taken against the dangers that may be caused because of electricity	The danger of the process is because of the gases at high pressure
The strength of the joint is more	The joint is not as strong as that of arc welding
Brazing and soldering cannot be performed by the electric arc.	The processes of brazing and soldering can be done with the gas flame.
The filler rod metal should be selected as the same metal as that of the parts of the joint.	The filler rod metal can be different from that of the parts of the joint.

5. What are the safety precautions during the process of Gas and Arc Welding?

Safety Precautions for Gas Welding

1. Gas cylinders should be kept in ventilated locations.
2. Cylinders should not be kept near hot locations. They should be kept away from electrical terminals.
3. Pressure regulators should be closed after the welding work is completed.
4. Regulators should be handled properly.
5. Old and worn out regulators should be replaced immediately.
6. The operator should wear goggles, gloves, apron and proper foot wear.
7. Fire extinguishers and first - aid box should be kept ready always.

Safety Precautions for Arc Welding

1. The welder should always wear goggles, Gloves, apron and proper footwear during welding.
2. Welding shop should be located properly, so that it does not cause any discomfort to others.
3. The welder should act carefully against electric shocks.
4. A high quality electrode holder should be put into use.
5. Power supply should be provided at required voltage and uniform current.

8. CNC MACHINES

1. Production is achieved by_____
 - a) man and machine
 - b) materials and tools
 - c) men, machine, materials and tools**
 - d) men and machine
2. In NC system the program instruction are given as,
 - a) information
 - b) numerical data**
 - c) symbols
 - d) threads symbols
3. IC refers to_____
 - a) information control
 - b) instruction control
 - c) internal control
 - d) integrated circuits**

3 MARKS

1. Define "Numerical control".

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

2. What are the types of Machine control unit?

- A. Inbuilt type
- B. Swivel type
- C. Stand alone type

3. Mention any three types of elements in Machine control unit.

1. Input reading unit
2. Memory unit
3. Processing unit
4. Output unit
5. Feedback unit

4. What are the functions of input reading unit?

1. To accept the input media
2. To collect the input media instructions.
3. To send them into processing unit.
4. To keep the input media safety for reuse.

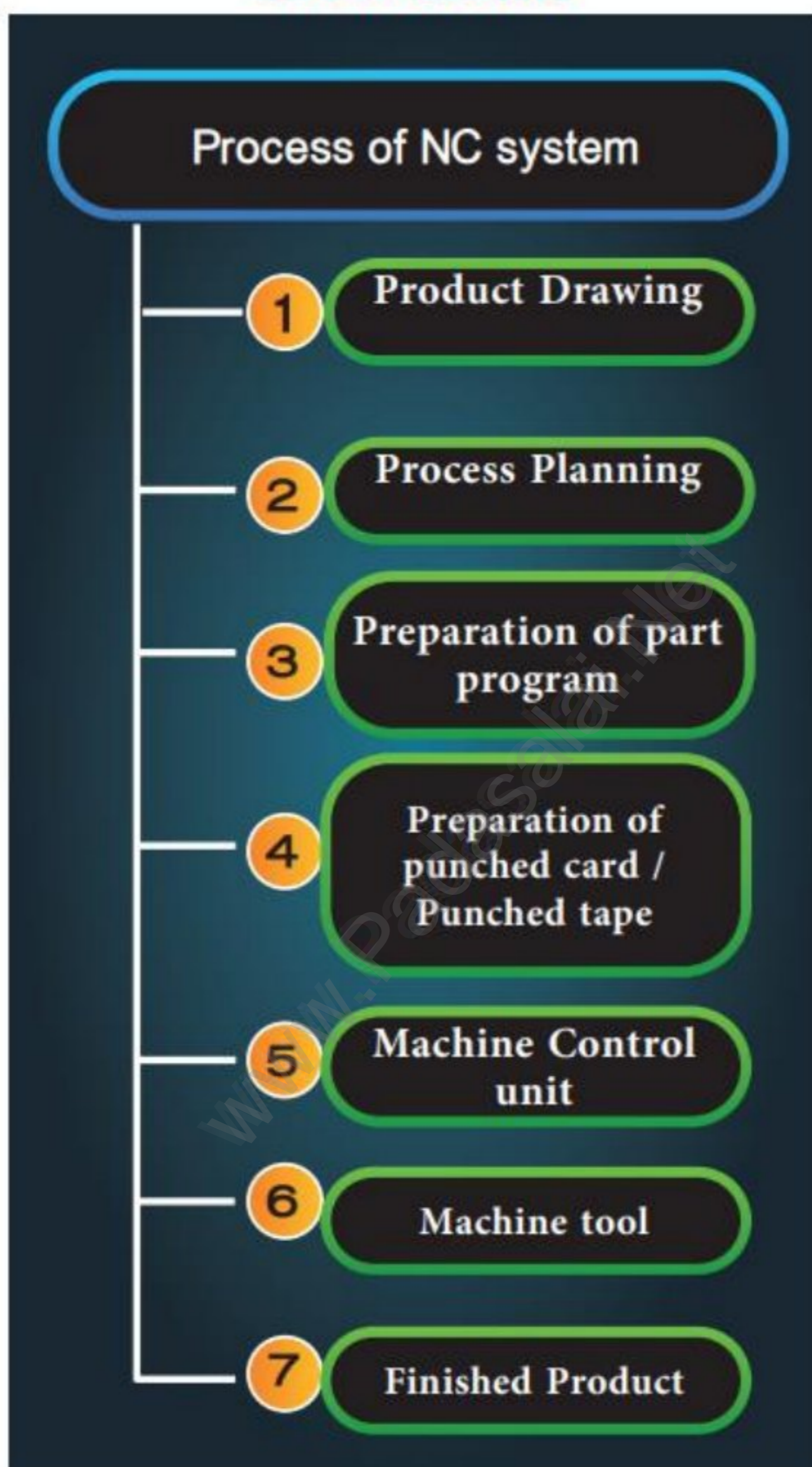
5. What are the disadvantages of CNC machine?

1. The cost of CNC machine is higher
2. Skilled programmers are needed for CNC machine
3. Maintenance expenses are higher

5 MARKS

1. Draw a flow - chart of NC system.

FLOW CHART



2. Explain "Input Media"

Different types of input media are used to store informations and to provide input to various control units of the NC machine.

They are

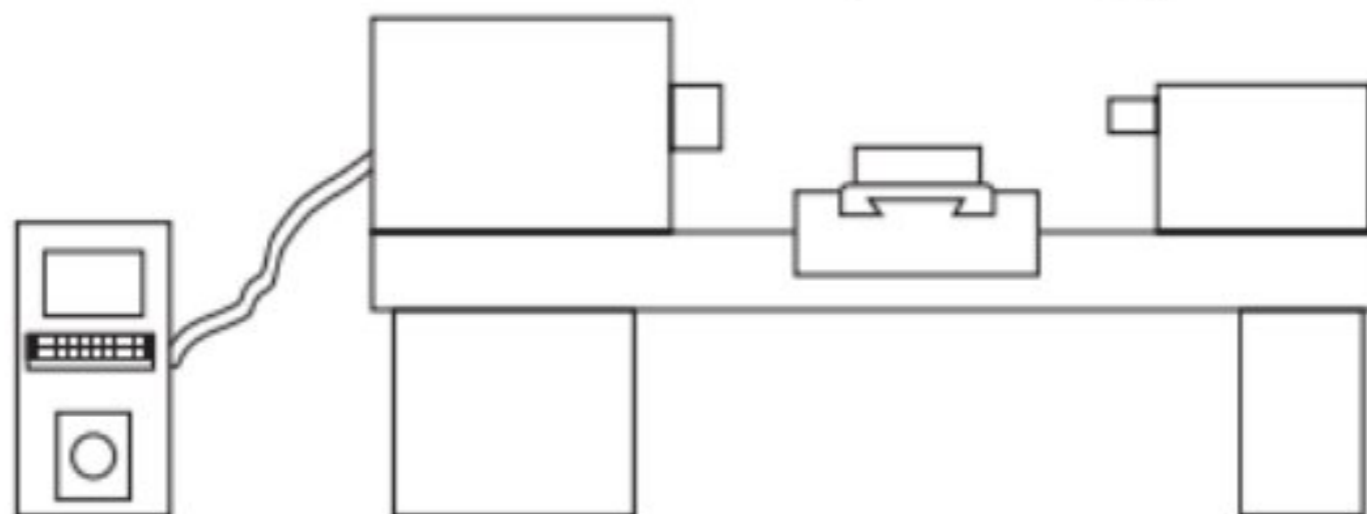
1. Punched cards
2. Punched tapes
3. Magnetic tapes
4. Floppy disks

Punched cards and punched tapes are useful in storing data in the form a series of punched holes. Punched tapes may be made of paper, plastic or aluminium foils. Magnetic tapes are made of plastic material and coated with Gamma ferric oxide layer. Magnetic tapes may be used for storing more informations and it may erased and reused.

3. What are the types of CNC machine?

1. CNC Lathe Machine
2. CNC Drilling Machine
3. CNC Grinding Machine
4. CNC Milling Machine
5. CNC Laser cutting Machine
6. CNC Plasma cutting machine
7. CNC Electric discharge machine
8. CNC Router Machine
9. CNC Automatic changing machine
10. CNC 5 - axis machine.

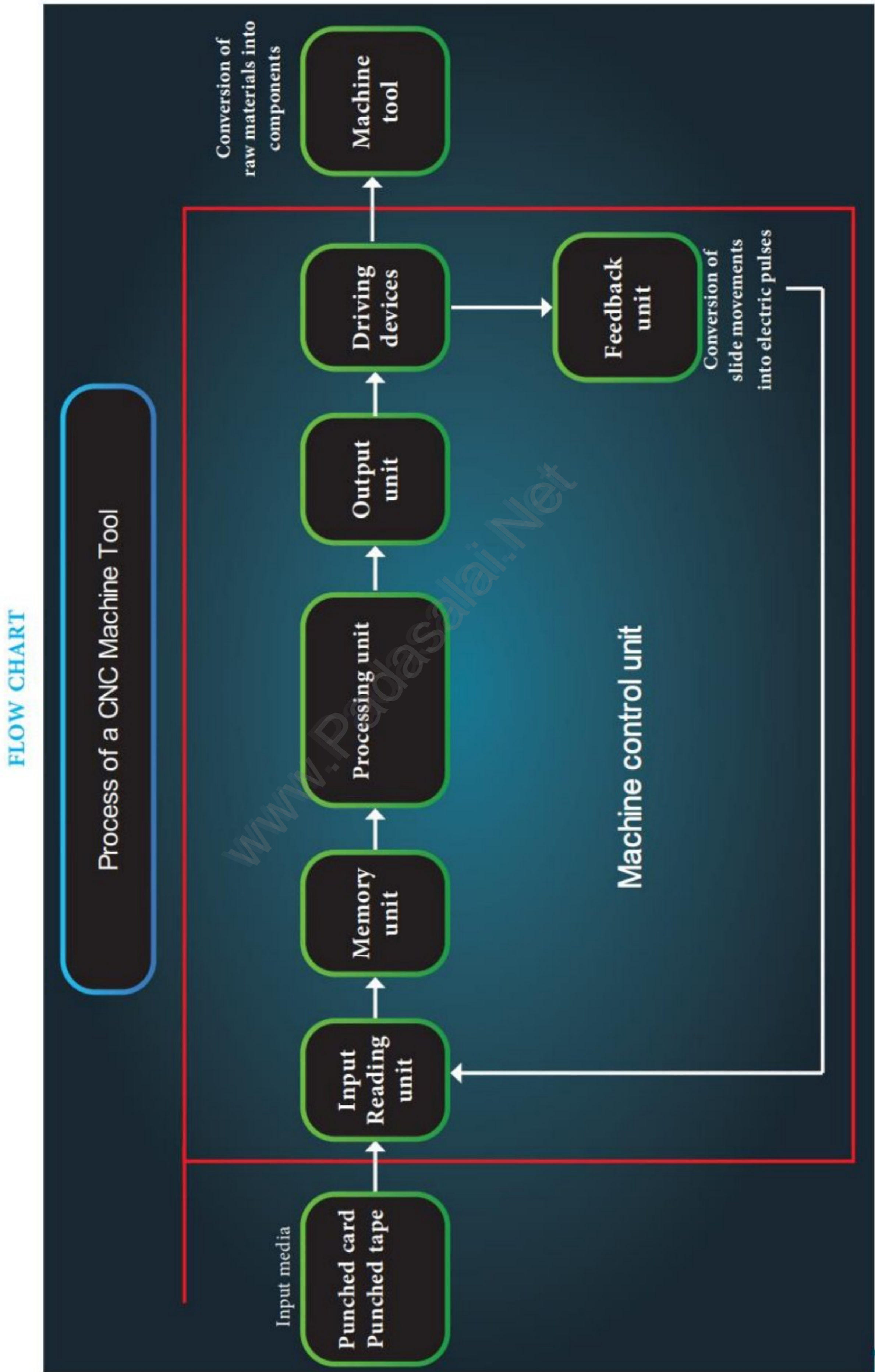
4. Explain with neat sketch any one types of Machine control unit.



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

10 MARKS

13. Draw a flow-chart of "Process of a CNC machine Tool"



14. What are the differences between CNC machine and conventional machine?

S.No	CNC Machine	Conventional Machine
1.	CNC Machine is more efficient and requires less labor and provides cost savings for all jobs	Conventional Machine is less efficient and requires more labor and more cost
2.	In CNC machine, computer program is loaded through software, so the human error is minimised in quality of the product.	In this machine, the quality of the product is dependent on the skills and abilities of the machine operator.
3.	Since CNC Machine run on computer commands, it is easy to give higher quality for large quantities.	Due to manual operation in conventional machine, it is difficult to give higher quality for large quantities.
4.	In CNC Machine operators with little skill can produce highly quality parts	In conventional machine operators need more skill to produce highly quality products.
5.	In CNC machine, since minimum operator involvement is needed to manage the CNC process, a single operator can manage many machines at a time with high degrees of accuracy and precision.	Maximum operator involvement is necessary for this machine. A single operators can not manage many machines at a time.

9.AUTOMATION AND ROBOTICS

1. Centralized control automation belongs to_____
 - a) **Building automation system**
 - b) industrial automation system
 - c) standard automation system
 - d) partial automation system
2. The basic principles of robot is formed by_____
 - a) **Asimov**
 - b) Hectare
 - c) George devil
 - d) joseph rengal berger
3. The brain of the robot is called _____
 - a) sensor
 - b) **control system**
 - c) piston
 - d) Gears
4. The part which receives the commands and send to the control system in robot is_____
 - a) control system
 - b) gears
 - c) **sensor**
 - d) piston

3 MARKS

1. What is meant by "Automation"?

Automation is the technology by which a process or procedure is performed without human assistance.

2. What are the different types of automation?

1. Based on control
2. Based on Application

3. What are various types of "Based on control"? of automation

1. Partical Automation
2. Fully Automation

4. Mention the types of "Based on Application" of automation

1. Building Automation System (BAS)
 - a. Home Automation
 - b. Office Automation
2. Industrial Automation
 - a. Fixed Automation
 - b. Programmable Automation
 - c. Flexible Automation

5. What is "Robot"?

A robot is a multifunctional machine for the performance of a variety of tasks like human activities. It is a computer controlled automatic machine.

5 MARKS

1. What are the needs for industrial automation?

To increase the labour productivity ,,
 To improve the product quality ,,
 To reduce the labour or production cost ,,
 To reduce routine manual tasks ,,
 To improve safety ,,
 To assist remote monitoring.

2. What are the applications of automation?

1. CNC Machines
2. Automatic production wings
3. Automatic assemble section
4. Manufacturing of Robots

3. What are the needs of robot?

To improve the quality of products
 To reduce the preparation time
 Skilled labour shortage
 To reduce rising cost
 Pressure to increase production rates to compete market.

4. What materials are required to make "Robot"?

- | | |
|------------------|-----------------------------------|
| 1. Polystyrene | 2. Plexiglass |
| 3. Rigid PVC | 4. ABS plastic |
| 5. Polycarbonate | 6. Polyethylene and polypropylene |
| 7. Nylon | |

10 MARKS

1. What are advantages and disadvantages of automation?

Advantages

Increased throughout productivity.
 Improved quality or increased predictability of quality ,,
 Reduce overall production cost
 Less floor area required

Human fatigue is greatly minimized
 Replaces humans in tasks done in dangerous environments
 (i.e. fire, space, volcanoes, nuclear facilities, underwater, etc.)
 Reduces operation time and work handling time significantly.
 Reduce maintenance requirements
 Uniform components are produced

Disadvantages

Possible security threats/vulnerability due to increased relative susceptibility for committing errors.
 Unpredictable or excessive development costs.
 High initial cost.
 Displaces workers due to job replacement.
 Leads to further environmental damage and could compound climate change.

2. Explain about the important parts of robot.

1. Power supply the working power to the robot is provided by batteries, hydraulic, solar power or pneumatic power sources.

2. Actuators Actuators are the energy conversion device used inside a robot. The major function of actuators is to convert energy into movement.

3. Electric Motor (DA/AC) This is used for converting electrical energy into its equivalent mechanical energy. In robots, motors are used for providing rotational movement.

4. Controller: Controller is a part of robot that coordinates all motion of the mechanical system. It also receives information's from outside through various sensors. The controller is also known as "Brain of the Robot"

5. Sensor Sensor is an important part of robot.

It is used to collect information from the environment and carried to controller of robot. This will help controller to make decisions' about tasks like how to move or where to go next. The important types of sensor are

- a. Vision sensor
- b. Proximity sensor
- c. Sound sensor

d. Temperature sensor

e. Acceleration sensor

f Pressure sensor

6. Tooling in end of arm (Ex: gripper or spray gun or welding electrode)

3. What are the advantages and disadvantages of robot

Advantages

1. Lifting and moving heavy objects
2. Working in holistic environment
3. Providing repeatability and consistency
4. Working during unfavourable hours
5. Performing dull or momotonous jobs
6. Increasing productivity and safety
7. Achieving more accuracy than human beings

Disadvantages

1. The robots lack capability to respond in emergencies
2. The initial and installation cost of equipment high
3. They replace human workers, thus causing unemployment.

10.INDUSTRIAL MANAGEMENT

1. Work study is ____
 - a. Method of plant study
 - b. A technique of increasing production**
 - c. Method study
 - d. Work measurement
2. Production planning is____
 - a. Productivity of men
 - b. Productivity of land
 - c. Scheming of productivity procedure**
 - d. Quality control
3. Father of 'scientific management' is ____
 - a. Henry Fayol
 - b. Pierre Vernier
 - c. F.W. Taylor**
 - d. Michael Faraday
4. The book "general and industrial management" was written by
 - a. Michael Faraday
 - b. Henry Fayol**
 - c. F.W. Taylor
 - d. Pierre Vernier
5. The book " the principles of scientific management" was written by
 - a. Pierre Vernier
 - b. F.W. Taylor**
 - c. Michael Faraday
 - d. Henry Fayol
6. DMAIC stands for a
 - a. Define, Make, Act, Improve, Control
 - b. Define, Measure, Analyse, Improve, Control**
 - c. Design, Mould, Alter, Interact, Cold
 - d. Define, Mould, Analyse, Improve, Control
7. DMADV stands for
 - a. Define, Measure, Act, Deliever, Verify
 - b. Do, Make, Analyse, Design, Vertical
 - c. Define, Measure, Analyse, Design, Verify**
 - d. Define, Make, Analyse, Design, Verify
8. The expenditure on the maintenance of the machines are
 - a. Administrative expenditure**
 - b. Worker's wages
 - c. Cost of raw material
 - d. Tax
9. Cost of accessories which is used to hold and guide the job are
 - a. Administrative expenditure
 - b. Jigs and fixtures cost**
 - c. Worker's wages
 - d. Cost of raw material

3 MARKS

1. What do you know about “plant Location”?

Plant location is an important exercise of selecting a suitable site and area of establishing a new plant or for expanding an existing plant.

2. What do you know about “industrial management”?

Factory is a place of required resources collected in one place to manufacture materials in correct size and correct shape. The resources are trained men, raw materials, machines etc.

3. Define “work study”

Work study is a technique to increase the productivity. It is used to find out the reasons for shortfall in the efficiency of the human work and set guidelines for improvement.

4. Define “method study”

Method study is a systematic recording and critical analysis of the method of doing a work.

5. Define “work measurement”

Work measurement is a technique to find out the time taken for a qualified worker to finish a specified work at a particular level of performance.

6. List seven quality control tools.

1. Check sheet.
2. Control Chart
3. Histogram

7. What is Statistical Process Control (SPC) and Process Capability?

Statistical process control (SPC) is a Quality control method which uses statistical methods to monitor and control a process.

8. Define Six Sigma

Statistical process control (SPC) is a Quality control method which uses statistical methods to monitor and control a process.

9. Define Kaizen.

Kaizen is small improvements systematically carried out on a continual basis by all employees.

10. Define “cost estimation”

Cost estimation can be defined as the estimation of expenditure for the entire manufacturing process of an object produced in a factory.

11. What is machining charges?

The machining charges are calculated by the duration of machining on each of these machine tools involved in manufacturing the particular component.

5 MARKS

1. What are the advantages of the good plant location?

1. Handling of materials and transportation becomes minimum.
2. The rate of production increases because of effective use of man and machines.
3. Workers feel comfortable with less movement inside the plant.
4. The available space is economically and efficiently used.
5. Investments on equipments becomes minimum.
6. Simple, easy and effective supervision is possible.

2. What are the functions of PPC(Production Planning and Control)?

1. Pre-planning: It involves the decisions of the preparatory functions in the production process.
2. Route plan: It is the plan arranging various activities that take place from the stage of raw material to the finished product.
3. Scheduling: Scheduling is the preparation of a time table to show the time of starting and the time of completing of operations involved in production of each component.
4. Despatching: It is the process to deliver the route plan and schedule to the respective departments.
5. Controlling: It is the process of getting reports from all departments regarding production and taking correcting actions, if necessary

3. Explain about quality control?

Quality

Product quality refers to how well a product satisfies customer needs, serves its purpose and meets industrial standards. It depends on the product, the machine, cutting tools and work holding devices.

Definition of Quality control

A system of maintaining standards in manufactured products by testing a sample of the output against the specification.

4. How many groups are there in industrial undertakings categorized by Henry Fayol?

1. Technical activities (production related)
2. Financial activities (Capital related)
3. Commercial activities (buying material and selling products)
4. Security activities (protection of properties)
5. Accounting activities (Statistics and Stock Taking)
6. Managerial activities (plan and control)

5. Write “types of organizations”?

1. Line organisation
2. Taylor’s functional organization
3. Line and staff organisation
4. Line and functional staff organisation
5. Committee organisation.

6. What are the points should be taken into account for “Cost estimation”?

1. Cost of raw materials
2. Machining charges
3. Wages for the worker
4. Cost for making accessories
5. Administrative expenditure
6. Profit

10MARKS

1. List out the importance to be considered in selecting a plant location?

1. The plant should be located as near as possible to the place where the raw materials are available. This will reduce the cost involved in transportation of the raw materials.

2. The location should be conveniently connected by highways and railways.

3. The availability of adequate labour is an important factor.

4. The topography of geography, area of available land, shape of the site and drainage facilities should be suitable to the needs of the plant. The location should not be prone to floods and earthquakes.

5. Sufficient quantity of quality water should be available near the plant location.

6. The atmosphere of the plant should provide adequate lighting and ventilation facilities.
7. Electrical power of adequate strength and necessary fuel should be available at the plant location.
8. Location of the plant should be selected to avail maximum tax concessions, loan facilities and low power tariff.
9. Proper housing facilities for the employees, presence of hospitals, educational institutions, banks, markets and recreational facilities should also be considered while selecting locations.
10. Presence of related industries near the location is preferable.

2. What are the factors for increasing Productivity?

1. By improving the working conditions.
2. By improving the process involved in production
3. By reducing the non-productive time by work measurement
4. By providing suitable incentives to the workers.
5. By proposing better plant maintenance programmes.
6. Old and worn out machines should be corrected to make them function as before.
7. Men, Machine and Materials should be maintained at the required quantum.
8. By providing the operators with new and proper training.
9. Layout of the plant and equipments should be improved.

3. Explain about productivity of men and machine?

We consider a case of machinist who works on a milling machine and makes 40 gears a day. By improved methods of work, the same machinist is able to machine 50 gears in a day.

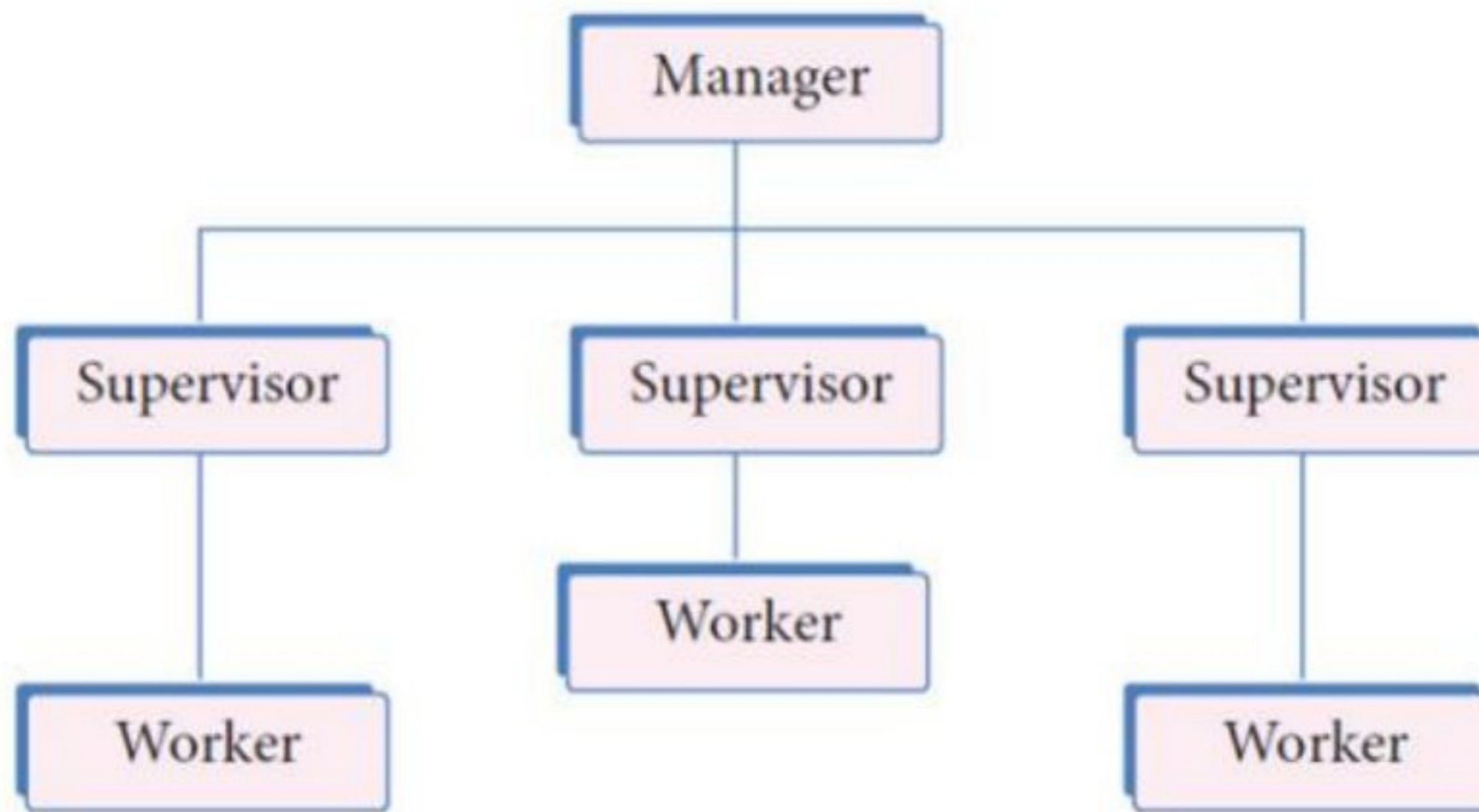
The increase in productivity can be calculated as,

$$\text{Increase in Productivity} = \frac{\text{Change in Production}}{\text{Original Production}} \times 100$$

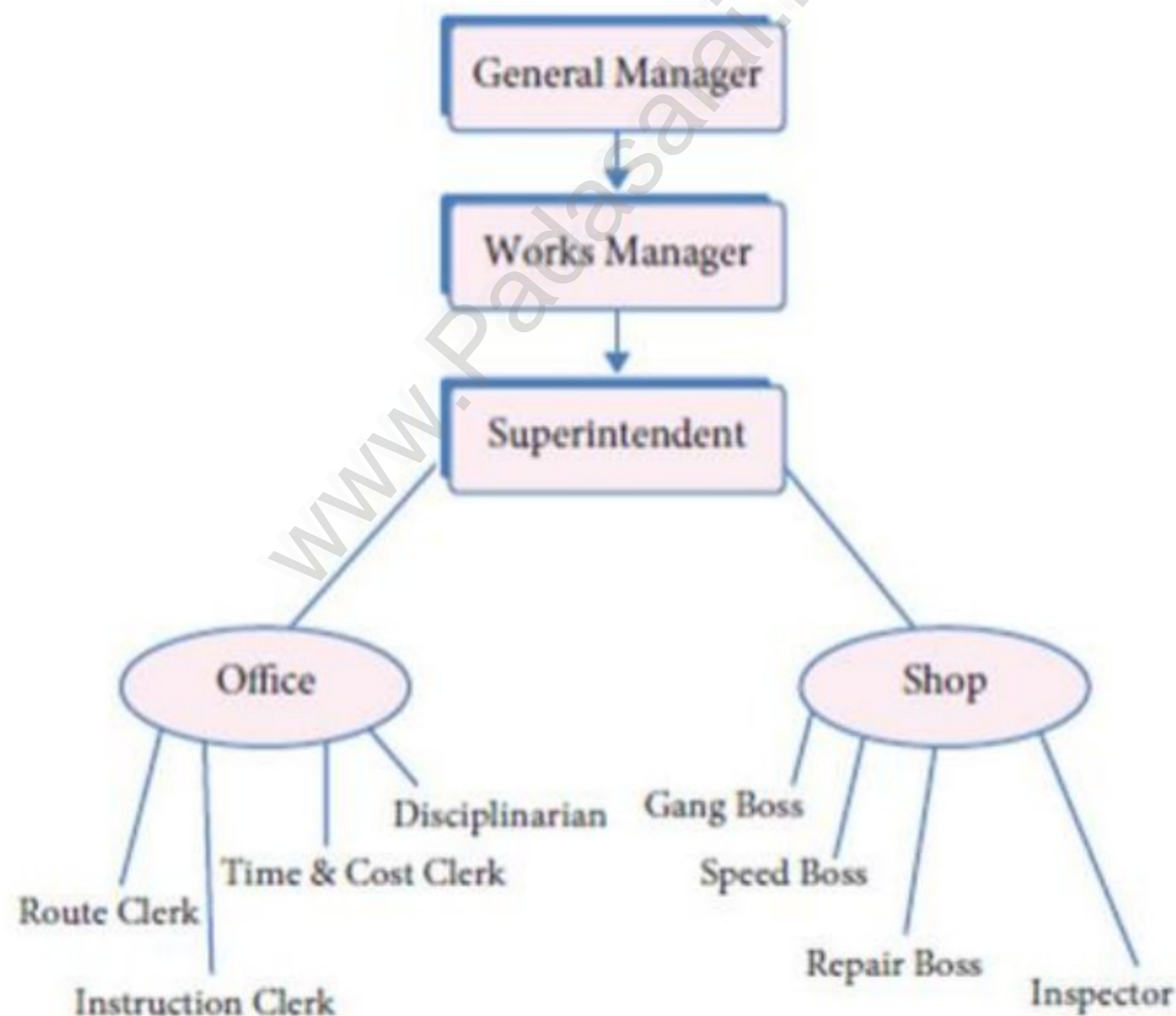
$$\text{(Input) Productivity} = \frac{50-40}{40} \times 100 = 25\%$$

4. Draw a simple organization method and functional organization chart?

Simple Organization Chart



Functional Organization Chart.



5. Define Lean manufacturing and explain seven wastes in Lean Manufacturing.

1. Waste of over Production Producing more than customer demand or producing too earlier is called as over production and is a waste.

2. Waste of Rework Producing defective products, segregating and reworking defective products is a waste.

3. Waste of Waiting The parts should move from one process to the next and ultimately to the customer without any waiting. Parts waiting for want of anything is a waste. (Example: Machine breakdowns, Tool/die changeover etc.,)

4. Waste of inventory Inventory is the quantity / amount of raw materials, Work in process items (WIP) and finished goods (Products) owned by a company (available in hand). Holding more inventory than needed is a waste.

5. Waste of transportation Excessive (unproductive) movements and handling of material due to incorrect plant layout is a waste.

6. Waste of Motion Any movement of people that does not add value to the product is a waste. Workplaces and processes need to be designed considering ergonomics.

7. Waste of Over Processing Processes that add more value to a product, but that is not a customer requirement or product's functional requirement is called as over processing and is a waste.

6. Write and Explain the "Administrative Expenditure"?

The administrative expenditure can also be called as 'overhead charges'. It includes:

1. Depreciation (wear and tear on machine tools and other tools)
2. Repairs and maintenance of the machine tools.
3. Expenditure on fuels and electricity.
4. Rent and maintenance paid for the building of the manufacturing unit.
5. Salary paid to the administrative staff and expenses for purchasing office records.
6. Salary paid to the supervisors, storekeepers and watchman.
7. Expenditure for advertising, travel and postage.
8. Amount spend for the Welfare of the workers, and contribution to the employee's fund (it includes savings for workers, medical insurance, their child education fund and other expenses)
9. Interest on capital.

BOOK INSIDE ONE MARK WITH ANSWER

1. LATHE

ONE MARK

1. Which machine tool is called mother of machine tool **lathe**
2. In what type of bed the metal chips falls automatically on the tray **v-bed**
3. What type of bed is useful to handling large work pieces **flat bed**
4. The front end of the spindle hole is **taper** to receive the live centre.
5. Carriage is located between the **head stock** and **tail stock** on the lathe bed .
6. What type thread is found in lead screw of a lathe **acme**
7. The lathe used for machining small or tiny and precise parts **bench lathe**
8. What type of lathe is used for manufacturing tools like jigs and fixtures **Tool room lathe**
9. concentric circles are found in a **four jaw chuck**
10. Magnetic materials are hold by a **magnetic chuck**
11. Concave ring and convex rocker are used in **single screw tool post**
12. Mention the types of spindle driving mechanism **step cone pulley, back gear & gear box**
13. How many speeds are obtained by step cone pulley drive **four**
14. How many speeds are obtained by all gear drive **nine**
15. How many speeds are obtained by back gear drive **eight(4 direct & 4 indirect)**
16. Work pieces of short length, large diameter and irregular shapes are hold by **chucks**
17. Which type of chuck is used for holding round and hexagonal bar work pieces **three jaw chuck.**
18. According to the construction, the lathe tools are classified into **solid,brazed&tool bit and tool holder**
19. According to the operation to be performed, the lathe tools are classified **into turning tool, facing tool &forming tool**
20. Formula for finding taper angle in compound rest swiveling method

$$\tan \theta = \frac{D-d}{2l}$$
21. Formula for finding taper angle in tail stock set over method **S=L X $\frac{D-d}{2l}$**
22. Mentions the patterns of knurling tool **straight, inclined & diamond.**
23. In which year the lathe was developed **1797**
24. In turning operation in a lathe which part can be moved in what direction **carriage, longitudinal**
25. Facing operation in a lathe which part can be moved in what direction **cross slide, cross wise**

26. Head stock is mounted **permanently** on the inner guide ways at the left side of the bed
27. Tail stock is designed to function as two unit **lower and upper casting**
28. The shape of the saddle is **H-shape**
29. What type of joint is used to connect the cross slide and compound rest **tongue and groove joint**
30. What are the position in tumbler gear mechanism **Neutral, forward & reverse**
31. What type of joint is used to connect compound rest and compound slide **dove tail joint**
32. Drilling centre holes which type of lathe is used **centring lathes.**
33. To produce wooden blanks which type of lathe is used **wood working lathe.**
34. To making tumblers which types of lathe is used **metal spinning lathe.**
35. To polishing vessels which type of lathe is used **polishing lathe.**
36. The earlier lathe was driven by **steam engine.**
37. What are the types of special lathe **wheel lathe, Gap bed lathe, 'T'-lathe, Duplicating lathe.**
38. In which chuck the work is held quickly and easily **Three jaw chuck.**
39. In which type of chuck the very small thin and light work pieces can be held **magnetic chuck.**
40. What type of work holding device it has U-slot (or) elliptical slots **catch plate.**
41. What are the types of carriers **straight tail carrier, bent tail carrier.**
42. Hollow with screwed work piece are held with screwed **arbor mandrel.**
43. Centers are made with **H.C.S.Hardened material.**
44. What are the types of rest **steady rest, follower rest.**
45. What are the different types of pitches in Knurling operation **coarse, Medium, fine.**
46. What is the formula to find out the depth of cut in lathe **Depth of cut = $\frac{d_1 - d_2}{2}$**
47. Which types of tool post is used to mount four tools at the same time **fourway toolpost.**
48. Which types of tool post is not used for heavywork **single screw tool post.**
49. In lathe heavy or irregular shaped jobs are held by **4 Jaw chuck.**
50. Write any one use of back gear mechanism of a lathe **the speed obtained by this mechanism is used when thread cutting and knurling operations are performed.**

51. The driving plate and catch plates are used when the work is held by chuck state **true or false.**
52. Head stock is located at the **extreme left** of the bed
53. Tailstock is located at the **right extreme** of the bed
54. In older machine tools **flat bed** type of guide ways are used
55. **Flat bed** is not accurate
56. The primary task of a lathe is to generate **cylindrical** work pieces
57. The head stock houses **hollow** spindle
58. The front end of the spindle is **threaded** on which any one of the work holding devices can be screwed
59. Lead screws are **acme** threaded
60. Bench lathe is used for **machining tiny and precise parts.**
61. The head stock houses a **hollow** spindle and the mechanism for driving the spindle at **multiple** spindle
62. The spindle rotates on **two large bearing** housed on the head stock casting.
63. Head stock spindle is made of **carbon (or) nickel chrome steel**
64. In tailstock the spindle will be **withdrawn** inside the hole if the hand wheel is rotated in **anti clock wise** direction
65. In which lathe lead screw, feed rod, apron are not found **speed lathe**
66. In semi automatic lathe **parting tool** is mounted on the rear tool post.
67. In lathe feed is expressed in **mm per revolution.**
68. Which method of taper turning is suitable for short length tapers only **form tool method.**
69. **Boring tool** and **parting tool** is used for undercutting.
70. Inner and outer taper can be performed by **compound rest method**
71. On doing taper turning in compound rest method feed will be given to the tool from **small diameter to large diameter**
72. Four way tool post is known as **turret tool post**
73. Four way tool post is used in **heavy duty work**
74. Plain mandrel ratio will be around **1 to 2 mm** for a length
75. Lathe bed is made of **cast iron**
76. Plain mandrel is also known as **solid mandrel**
77. An important operation performed in lathe is **thread cutting**
78. Knurling tool is a **embossing tool**
79. Turret and capstan lathes are classified under **semi automatic lathe**
80. Name a device useful in holding a long work piece **center**
81. Name the device useful in holding a work with a central hole is **mandrel**

3 MARKS

1. What is meant by leadscrew?
2. What is meant by feed rod?
3. Define feed in a lathe?
4. What are the uses of tailstock?
5. What is meant by depth of cut?
6. What is meant by thread cutting?
7. What is taper?
8. What is driving plate?
9. What is catch plate?
10. What is mandrel?
11. What is rest?
12. Mention the uses of tumbler gears in a lathe.
13. List out the parts of lathe.

2. DRILLING MILLING

1. The portable drilling machine can accommodate drills from **12mm to 18mm** diameter.
2. Sensitive drilling machine can accommodate drills upto **15.5mm** diameter.
3. Which type of drilling machine having four to six drill heads **gang drilling machine**.
4. The angles of counter sink tool will generally **60°, 82° or 90°**.
5. What is the ratio of taper fund in a drilling machine spindle **1:20**.
6. What are the two types of deep hole drilling machine **Horizontal, Vertical deep hole drilling machine**.
7. Boring operation in some precision drilling machine is performed to enlarge the hole to an accuracy **0.00125mm**.
8. Formula for finding cutting speed in drilling operation $\frac{\pi d n}{1000}$ m/min.
9. Abbreviation of TPI **Thread per inch**.
10. Lighter workpieces are drilled in **sensitive drilling machine**
11. What is the necessity of workholding device in drilling machine **it is used to hold firmly on the machine table**.
12. What is the use of universal vise **swiveling and tilting the work piece at required angle**.
13. What are the types of clamps used to **plain, slot clamp, finger & goose neck clamp**.
14. Name the device used to hold the work and guide the tool in drilling machine **drill jig**.
15. Types of jig **-plate jig, channel jig, diamond jig, box jig, indexing jig**
16. Types of drill bit **flat drill, straight fluted drill twist drill, centre drill**.

17. Drill bits are made of **HSS. HCS.**
18. What are the types of twist drill. **Straight shank twist drill & taper shank twist drill**
19. The diameter of the straight shank drill bit ranges from **2 to 16mm.**
20. Counter bore tools are having two flutes **straight and helical.**
21. Counter bore straight fluted tools are used for machining **Brass and Aluminium material.**
22. Counter bore helical fluted tools are used for machining **longer holes**
23. Reaming operation removes very small amount of metal approximately **0.375mm.**
24. The tapping attachment is used to hold the tool known as **tap.**
25. **The drilling machine designed for handling large and heavy work pieces radial drilling machine**
26. The tool used for spot facing operation **counter bore**
27. Portable drilling machine motor is **universal type**
28. V- Block are made of **cast iron (or) steel**
29. Angle plates made of **cast iron**
30. Clamps are made of **mild steel**
31. How the feed is expressed in drilling machine **feed per min**
32. Tang of the drill bit is **flat**
33. Except drilling all operation all operations are carry out by reducing the spindle speed **25%**
34. A 12 mm drill bit may produce a hole of size **12.125mm**
35. Tap drill size **D= T-2d**(or) **D= 0.8T**
36. In drilling depth of cut is expressed **t = d/2 mm**
37. In super sensitive drilling machine **0.35 mm** diameter holes can be produced.
38. Portable drilling machine are generally used in **automobile built up work**
39. HCS - **High carbon steel**
40. HSS - **High speed steel**
41. In super sensitive drilling machine **0.35mm** diameter holes can be produced.
42. Super sensitive drilling machine spindle rotates at a high speed of above **2000 rpm**
43. Drilling machine was developed in the year **1889**
44. Drilling machine was developed by **Arthur james arnot/ William blanch brain**
45. Sensitive drilling machine was developed by **D Eliedge**
46. Sensitive drilling machine was developed in the year **1958**
47. Radial drilling machine was developed by **Geoffry reeves**
48. Radial drilling machine was developed in the year **1890**

49. Twist drill is invented by **steve A. morse** in the year **1861**
50. Reamer is a **multipoint cutting tool**
51. The point angle of a drill is **118°**
52. The number of revolutions of a spindle in one minute is known as **RPM**
53. Name the device used to guide the tool when drilling is performed on many number of identical work pieces is **drill jig**
54. Name the groove present on the drill is **flutes**
55. What is the name of the device used in holding drills with straight shanks
Drill chuck
56. Name the device useful in holding a cylindrical workpiece on drilling machine table **V-block**
57. What type of a drilling machine is used to drill in the barrels of guns **deep hole drilling machine**
58. Which stroke of the shaper is faster **return stroke**
59. What are the types of surfaces are machined in shaping machine are **flat, horizontal, vertical**
60. Taps are made of **carbon steel (or) high speed steel**
61. Types of taps **are hand tap and machine tap**
62. Taper shanks are provided on drills of larger diameter of **16 mm above.**
63. The tool may be removed by pressing a tapered wedge known as **drift**

3 MARKS

14. Define feed in a drilling machine?
15. What is meant by depth of cut?
16. What is meant by feed?
17. Difference between any two operations (all operations)
18. Mention the parts of drilling machine.
19. Calculate the tap drill size. When outside diameter of the tap is 10mm the pitch of the thread is 1.5 mm and depth is 0.61mm.

3. SHAPING MACHINE

1. In which year the shaping machine was developed **1836**
2. The length of the stroke is calculated to be nearly **30 mm** longer than the work piece
3. Mention some regular operation performed in shaping machine
horizontal, vertical & angular
4. Mention some special operation performed in shaping machine
machining dove tail, v-groove and tongue and groove joint
5. Name the tool holding device used for machining internal keyways
snout bar.

6. Mention the types of quick return mechanism **crank and slotted link mechanism Hydraulic mechanism, withworth mechanism.**
 7. What is angle of forward cutting stroke **216°**.
 8. What is angle of return stroke **144°**.
 9. Which type of shaping machine is used for machining heavy duty work **Hydraulic shaper.**
 10. Name the shaping machine used in position workshop **universal shaping machine.**
 11. In shaping machine R.H.tool is used for machining by moving the job from **right to left.**
 12. In shaping machine L.H.tool is used for machining by moving the job from **left to right.**
 13. In shaping machine depth of cut is expressed in **mm or in inches.**
 14. In shaping machine feed is expressed in **mm per stroke.**
 15. Which on of the following is not a shaper part a) ram b) tool head **c) carriage**
d) Column.
 16. One part of the soluble oil is mixed with **15 parts** of water to be used as coolant.
 17. The shaping machines maximum stroke length are **300,450&600**
 18. In shaping machine cutting speed is expressed in **meter per minute**
 19. In shaper depth of cut is expressed in **mm (or) inches**
 20. Shapers with maximum stroke length of **175 to 900mm**
 21. Feed is given at the **end** of the return stroke in shaping machine.
 22. Lubricant cannot be used as **coolant.**
 23. Machining internal keyways are done by using special tool holder called **snout bar**
 24. The cutting edge of goose neck tool has a **springy action**
- Formula for shaping machine **Cutting speed = length of the cutting stroke / time required by the cutting stroke**

3 MARK

1. What is the size of shaping machine?

4. GRINDING MACHINE ONE MARK

1. Which machine consists of two table's **cylindrical grinding machine.**
2. In cylindrical grinding machine the upper table can be swiveled about **±10°**.
3. In centre less grinding process an angular adjust of regulating wheel up to **0 to 10°**.

4. Grinding wheel refers to the hardness with which the wheel holds the abrasive grains **grade**.
5. The relative spacing between the abrasive grains **structure**
6. The longitudinal feed during rough grinding is approximately **0.6 to 0.9mm** of the width of the grinding wheel
7. The longitudinal feed during finish grinding is approximately **0.4 to 0.6mm** of the width of the grinding wheel
8. In grinding the range of depth of cut is **0.005 to 0.04mm**
- 9.

Types of bond	symbol	Grinding wheel
Vitrified	V	Vitrified wheel
Silicate	S	Silicate wheel
Shellac	E	Elastic wheel
Resinoid	B	Resinoid
Rubber	R	Vulcanised wheel
Oxychloride	O	Oxychloride wheel

10. The rotary table type of surface grinder is specified by **the diameter of the chuck or table**
11. According to the construction grinding wheels are classified into **solid grinding wheels**
segmented grinding wheels & mounted grinding wheels
12. The speed of the vitrified grinding wheels should not exceed **2800 (or) 2000 meter per minute**
13. What are the surfaces produced in cylindrical grinding machine
cylinders, taper cylinder, faces, shoulders.
14. What is the name of the process to produce new sharp particles in glazed surface of grinding wheel **dressing**
15. What is the name of the process to produce true original shape of grinding wheel **truing**
16. Which type of bond is used to produce disc shaped wheels **shellac**
17. Internal cylindrical grinders are useful in grinding **cylindrical** and **taper holes**
18. Gear grinding is done by the **generating process** (or) **form grinding**
19. Silicon carbide abrasives are used for grinding **cemented carbide, ceramics materials, grey, brass, bronze, copper, aluminium, vulcanized rubber**
20. Aluminium oxide abrasive are used to grinding materials like **mild steel, carbon steel, hss, tough bronze**
21. The coolant used for grinding is **soda water**
22. Silicon carbide trade name is **carborundum**
23. Silicon carbide are two types **green grit** and **black grit**

24. Grinding wheels are classified into **solid, segmented** and **mounted**
25. **Diamond** is a hardest natural abrasive
26. The upper table of the cylindrical grinding machine is set at **0°** during cylindrical grinding
27. How many percentage of silica is added to manufacture a silicon carbide abrasive **56%**
28. How many percentage of powder coke is added to manufacture a silicon carbide abrasive **34%**
29. How many percentage of salt is added to manufacture a silicon carbide abrasive **2%**
30. How many percentage of saw dust is added to manufacture a silicon carbide abrasive **56%**
31. The washer thickness is not over **1.5mm** thickness should be fitted between the wheels
32. During truing the feed rate must not exceeds **0.02 mm**
33. After mounting the grinding wheel the wheel should be made to run idle for a period of about **10 to 15 mins**
34. The amount of material removed in this process is very less, usually **0.25 mm to 0.50 mm.**
35. First vertical rotary surface grinder was invented by **Henry K. Spencer**
36. The inventor of tool and cutter grinding machine is **Frank W. Curtis**
37. Aluminium is manufactured under the trade name of **aloxite**

3 MARKS

1. Define cutting speed in grinding machine?
2. Define feed in grinding machine
3. Define feed in a grinding machine?
4. Types of grinding wheel.
5. Types of abrasives.
6. Define depth of cut in grinding machine.

5. MILLING MACHINE

1. The table of the milling machine can be moved to an accuracy of **0.02mm.**
2. Give other name of up milling **conventional milling**
3. Arbor is drawn into the taper hole of the spindle by a **draw bolt**
4. Give other name of down milling is **Non conventional milling**
5. One (or) more cutters are mounted on the arbor by placing **spacing collars** between them.
6. Milling machine was developed by **Eli Whitney in 1818**

7. In 1861 Joseph brown , a member of brown and sharp company developed first **universal milling machine**
8. which is otherwise known as horizontal milling machine **plain milling machine**
9. What is the name of the device used to hold the small milling cutters having threaded holes at centre **screwed arbor**
10. Which milling cutter is used for parting off operation **metal slitting saw**
11. Which milling cutter is used for cutting narrow slots ,holes and flat surfaces **end milling cutter**
12. Which milling cutter is used for machining angular surface V grooves **angle milling cutter**
13. Another end of the arbor is supported by **over hanging arm**
14. Morse taper is also known as **self releasing taper**
15. What is the base of a milling machine made of **base**
16. Name the part which holds the other end of the arbor in a milling machine **arbor support (or) over hanging arm**
17. Collet is used for holding **straight shank milling cutters, End milling cutters and woodruff key cutters.**
18. The front portion of the collet is tapered and the portion is **split into three jaws**
19. If the taper shank of the cutter is smaller than the spindle nose, **the adapter is used**
20. The small cutters having threaded holes at the center are held by **screwed arbors**
21. To produce irregular contours surface, like convex and concave surfaces. Gear cutting **Form milling cutters are used**
22. To produce flat and horizontal surfaces **plain milling cutter** is used
23. To produce "T"- Slots **T -slot milling cutter** is used
24. The table of a universal milling machine can be swivelled by **45°**
25. **Omuniversal milling machine** is mostly used in tool room work.
26. 27. Types of arbor **1. Pilot end arbor, 2. Plain arbor and 3. Stub arbor.**

3 MARK

- 1.What is meant by feed?
- 2.What is meant by cutting speed?
- 3.What is meant by depth of cut?
4. What is the size of milling machine.

6. MACHINE TOOL MAINTENANCE

1. A maintenance done once in a year **corrective maintenance.**
2. In which method of lubrication the ring is used **Ring Lubrication.**
3. In which method of lubrication the wick is used **wick lubrication.**
4. The Annual budget for the maintenance for the maintenance work should be prepared at least **6 month or one year in advance.**
5. What are the two types of losses **Direct loss Indirect loss.**
6. Grease is manufacture with the ingredients of **soap and mineral oils.**
7. Operators and supervisor should know the importance **cutting speed, feed data of the machine tools.**
8. Over hauling of machine tools done **once in a year.**
9. The wear and tear on the gear should be observed **once in a week time**
10. Write any two instruments used for maintenance work **spanner, hammer, screw driver**
11. Spanner was invented by **solymen merrrick** in the year **1835**

3 MARKS

1. What is direct loss?
2. What is indirect loss?

7. WELDING

1. The other name of plastic welding is known as **pressure welding.**
2. The other name of fusion welting is known as **pressure less welding.**
3. In are welding the distance between the metal parts and electrode should be around **3mm.**
4. The temperature of arc welding is **5000°C to 6000°C.**
5. What are the types of electrodes **consumable electrode, non-consumable electrode.**
6. What is the temperature of gas welding **3200°C.**
7. The working pressure of oxygen is **1kg/cm².**
8. The working pressure of acetylene is **0.15kg/cm².**
9. Solder is an alloy made of **Tin** and **Lead**
10. Flux paste made of **zinc chloride** is applied on the parts by soldering iron.
11. Types of lap joint **single** and **double**
12. **Spring electrodes** are used in automatic welding
13. Gas welding is suitable for welding metal parts of thickness varying from **2mm to 50mm**
14. In neutral flame the temperature of the inner cone will be around **3200°c**

15. **2 pressure gauges** are fitted each on the oxygen cylinder and on the acetylene cylinder
16. How many zones are in neutral flame **2 zones**
17. How many zones are in carburizing flame **3 zones**
18. How many zones are in oxidizing flame **2 zones**
19. The melting temperature of the solder is in the range of **150°c to 350°c**
20. In brazing the filler rod is heated up to **450°c**
21. What is the color of oxygen cylinder **black**
22. What is the color of acetylene cylinder **maroon**
23. What is the color of oxygen hoses **black**
24. What is the color of acetylene hoses **red**
25. Oxy acetylene flame emits **ultra violet rays(uv) and infrared rays(IR)**
26. Arc welding is invented by **sir humbry david**
27. Gas welding is invented by **Nicole bennar dass**
28. TIG Welding - **Tungsten inert gas welding**
29. Name the flame obtained by supplying more acetylene than **oxygen carburizing flame**
30. Which type of welding required filler rod **Gas welding**
31. Which type of welding covert electrical energy into heat **arc welding/ resistance welding**
32. The strength of the welding joint is increased by adding **Nickel or Chromium in filler rod**

3 MARKS

1. What are the limitation of gas welding?
2. Write short notes on filler rod used in gas welding?
3. Mention the method of welding?
4. What are methods of welding?

8. CNC

1. Punched tapes made of paper, plastic material known as **mylar (or) aluminium foils**
2. Magnetic tapes are made of plastic and are coated with **gamma ferric oxide layer.**
3. Types of motors used in NC machines **servo motor, stepper motor synchros and resolvers**
4. NC machine is invented by john **T.Parsons in the year 1940**
5. NC Machine - **Numerical control**
6. CNC Machine - **Computer numerical control**
7. MCU - **machine control unit**
8. AC - **Adaptive control**
9. DNC - **Direct Numerical Control**

10. LAN - **Local area net work**
11. WAN - **Wide area net work**
12. The wires coming out of the processing unit are called **output unit**
13. Feed back unit converts physical quantities (displacement and velocity) into **electrical pulses**

3 MARKS

1. What is mcu?
2. What is adaptive control?
3. What are the elements of DNC?
4. Name some high level languages in NC machine.
5. What are the elements in Direct Numerical control.

9. AUTOMATION AND ROBOTICS

1. Father of automation was **Nikola Tesla**
2. Father of robotics was **George devil**
3. First unimate robot was developed in the year **1954**
4. First robot company is formed in the year **1956**
5. Unimate robot went online in a gm automobiles in **1961**
6. Law of Robotics is **Isaac Asimov**
7. BAS - **Building Automation system**
8. CAD - **Computer aided design**
9. CAM - **Computer aided manufacturing**
10. CIM - **Computer integrated manufacturing**
11. **90%** of programmed using teach method
12. Which automation is called hard automation **Fixed automation**
13. Which automation is called soft automation **Flexible automation**
14. **Printed circuit boards (PCB)**
15. **In industries originated in the invention of programmed material handling device by George. C. Devil in 1954**

3 MARKS

1. Mention the advantages of fixed automation
2. Mention the disadvantages of fixed automation
3. Mention the advantages of flexible automation
4. Mention the disadvantages of flexible automation
5. Mention the advantages of programable automation
6. Mention the disadvantages of programmable automation
7. What are the elements of automation.
8. What is meant by robotics?
9. Mention the components of robotics.

10. INDUSTRIAL MANAGEMENT

1. Work study= **Method study + Work measurement**
2. Productivity = **Production Output / Input of Resources**
3. PPC is the "**Brain of the Industry**"
4. **Henry fayol** joined as an engineer in a coal mining company in the year **1860**
5. Profit is calculated in the range of **10% to 30%** of the total cost of estimation

3 MARKS

56. List out the F.W.Taylor, Scientific Management procedures.
57. What is principle of Kaizen.
58. What is meant by profit?



"Today a reader, tomorrow a leader."
– Margaret Fuller.

ஒருமைக்கண் தான்கற்ற கல்வி ஒருவற்கு
எழுமையும் ஏமாப் புடைத்து.
- திருவள்ளுவர்.

