19/3/22

IAT-4

3.	Turret lathe (tool)	Capstan lathe
*	The turret head is mounted on the saddle	* The turret head is mounted on the ram.
*	Saddle is movable, to provide feed to the tool.	* Saddle is fixed, ram is movable to provide feed to tool
*	Saddle can be moved along the length of the workpiece.	* Ram has ~~its~~ a limited movement.
*	Limit dogs are used to control the distance of tool movement.	* Feed stop screws are used to control the distance of tool movement.
*	High cost	* Cost effective
*	Heavy and sturdy	* Light in construction.
*	Machining can be done by increasing feed and ~~depth~~ ~~cutting~~ speed, depth of cut.	* Machining cannot be done by increasing feed and depth of cut as it is limited.

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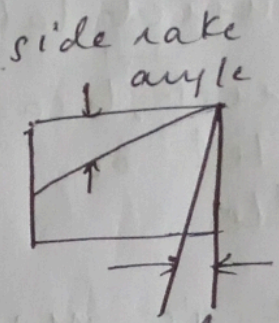
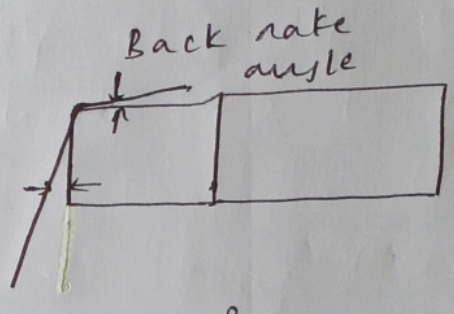
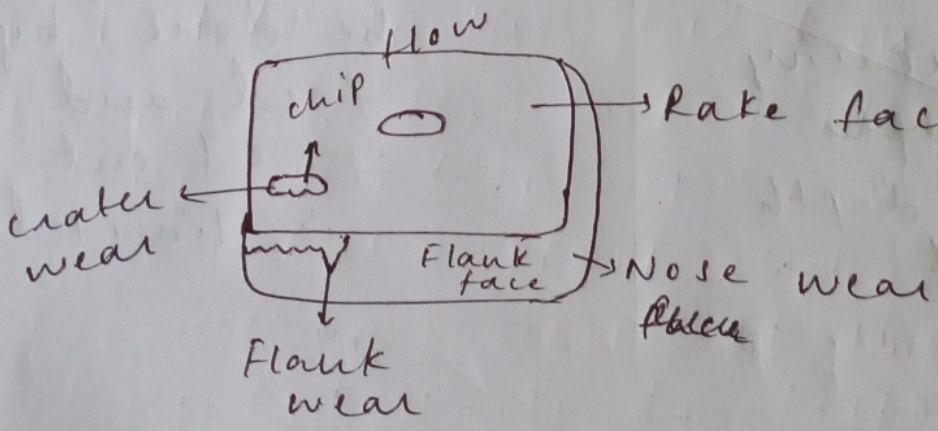
6. Tool signature of a single point cutting tool:-





Back rake angle = 10°
Side rake angle = 9°
End relief angle = 6°
Side relief angle = 5°
End cutting edge angle = 8°
Side cutting edge angle = 7°
Nose radius = 0.4 mm

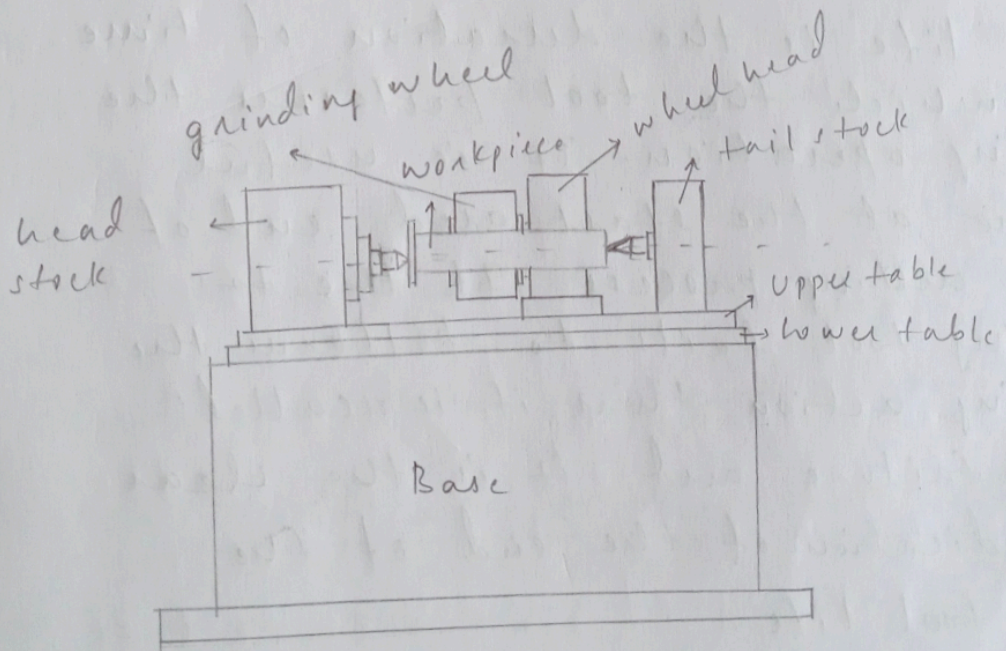


Flank wear :- The gradual and progressive wear on the flank portion of the cutting tool is called flank wear. The land gets

formed on the tool surface due to continuous rubbing of machine part of the workpiece. The width and length of wear decides the tool life and performance of tool. The flank wear causes variations in tool angles and clearances disturbing the performance of tool.

Crater wear :- The gradual and progressive wear formed on the rake face of cutting tool. A pit is formed on the tool surface away from cutting edge of tool by the flow of hard and abrasive chips. The depth of the crater wear increases causing breakage of tip of tool due to reduction in cross-section of tool.

8.



In the cylindrical grinding process there is headstock that fixes and rotates the workpiece at desired speed and tail stock provides support to the workpiece. The grinding wheel and wheel head are driven by electric motor. The grinding wheel can be moved either ~~per~~ perpendicular to the axis of workpiece or along the ~~direction of work~~ length of workpiece. When the grinding process begins both the grinding wheel and workpiece rotate. and the finishing is done on the ~~circut~~ cylindrical workpiece by the abrasive action of grinding particles.

9. Tool life is the duration of time for which the tool performs the cutting operation. It is useful ~~before~~ at the start and end of the cutting process. If the ~~to~~ cutting tool fails to perform the cutting action then it is called tool failure and it is the clear indication of the end of the tool life.

Relation between tool life and cutting speed :-

* Taylor's equation

$$VT^n = C$$

where, V = cutting speed in m/min

T = tool life in min

C = constant

n = constant that depends on tool material, type of finish and material of workpiece.

n is 0.1 for HSS

0.2 to 0.25 for carbides

0.4 to 0.55 for ceramics.

(10)

10. Tool life is the duration of time for which the tool performs cutting operations. It is useful at the start and end of the cutting process. If the cutting tool fails to perform the cutting action then it is called tool failure and it is the clear indication of end of tool life.

(8)

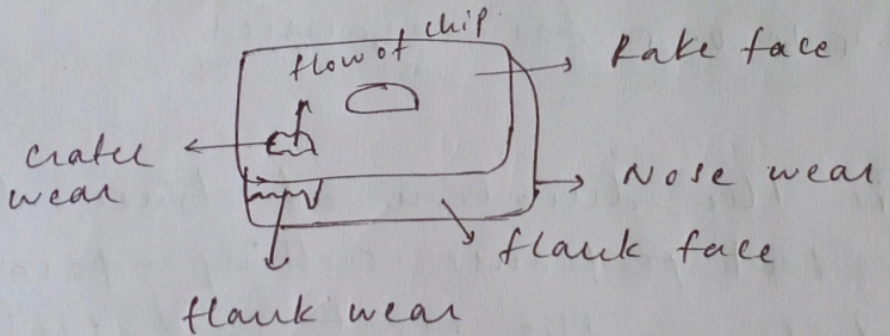
Factors that affect the tool life are :-

* Material of the tool

* Length of cut
* Type of machining (wet or dry).
* Tool parameters
* cutting parameters
* Material of the workpiece
* surface finish required for workpiece.

11. Tool wear is the main factor affecting ~~for~~ productivity and profitability of metal cutting process. If a tool loses its cutting ability then it is called tool wear or tool damage.

Flank and crater wear :-



Flank wear :- The gradual and progressive wear on the flank portion of the cutting tool is called flank wear. ~~It is~~ A land gets formed on the surface of the tool due to continuous rubbing of machine part of the workpiece. The width and

length of the wear decides the tool life and performance of the tool. The flank wear causes variations in tool angles and clearances causing failure of the performance of the tool.

Crater wear :- The gradual and progressive wear ~~that on the tool surface just away from the cutting edge of tool is called crater wear. It forms pit~~ on the rake face of the cutting tool is called crater wear. A pit is formed on the tool surface just away from the cutting edge of tool due to the flow of hard and abrasive chips. The ~~depth~~ increase in depth of crater wear will ~~reduce the damage~~ cause breakage of ~~tip~~ tip of the tool reducing the cross-section of the tool.

12. Relation for choice of cutting speed and feed, tool life for minimum cost and production time :-

Tool life for minimum cost :-

$$V_o = \frac{C}{\left\{\left(\frac{1}{n} - 1\right)\left(\frac{K_1 \times T_c + K_2}{K_1}\right)\right\}^n}$$

WKT, $VT^n = C$

So, $V_o T_{mc}^n = C$ -(1)

Substituting V_o in (1)

$$\frac{C}{\left\{\left(\frac{1}{n}-1\right)\left(\frac{K_1 \times T_c + K_2}{K_1}\right)\right\}^n} \cdot T_{mc}^n = C$$

$$\boxed{T_{mc} = \left(\frac{1}{n}-1\right)\left(\frac{K_1 \times T_c + K_2}{K_1}\right)}$$

For maximum production:-

$$V_{mp} = \frac{C}{\left\{\left(\frac{1}{n}-1\right) T_c\right\}^n}$$

WKT, $VT^n = C$

So, $V_{mp} T_{mp}^n = C$ -(2)

Substitute V_{mp} in -(2)

$$\frac{C}{\left\{\left(\frac{1}{n}-1\right) T_c\right\}^n} \cdot T_{mp}^n = C$$

$$\boxed{T_{mp} = \left(\frac{1}{n}-1\right) T_c}$$

where, V_o = cutting speed at minimum cost

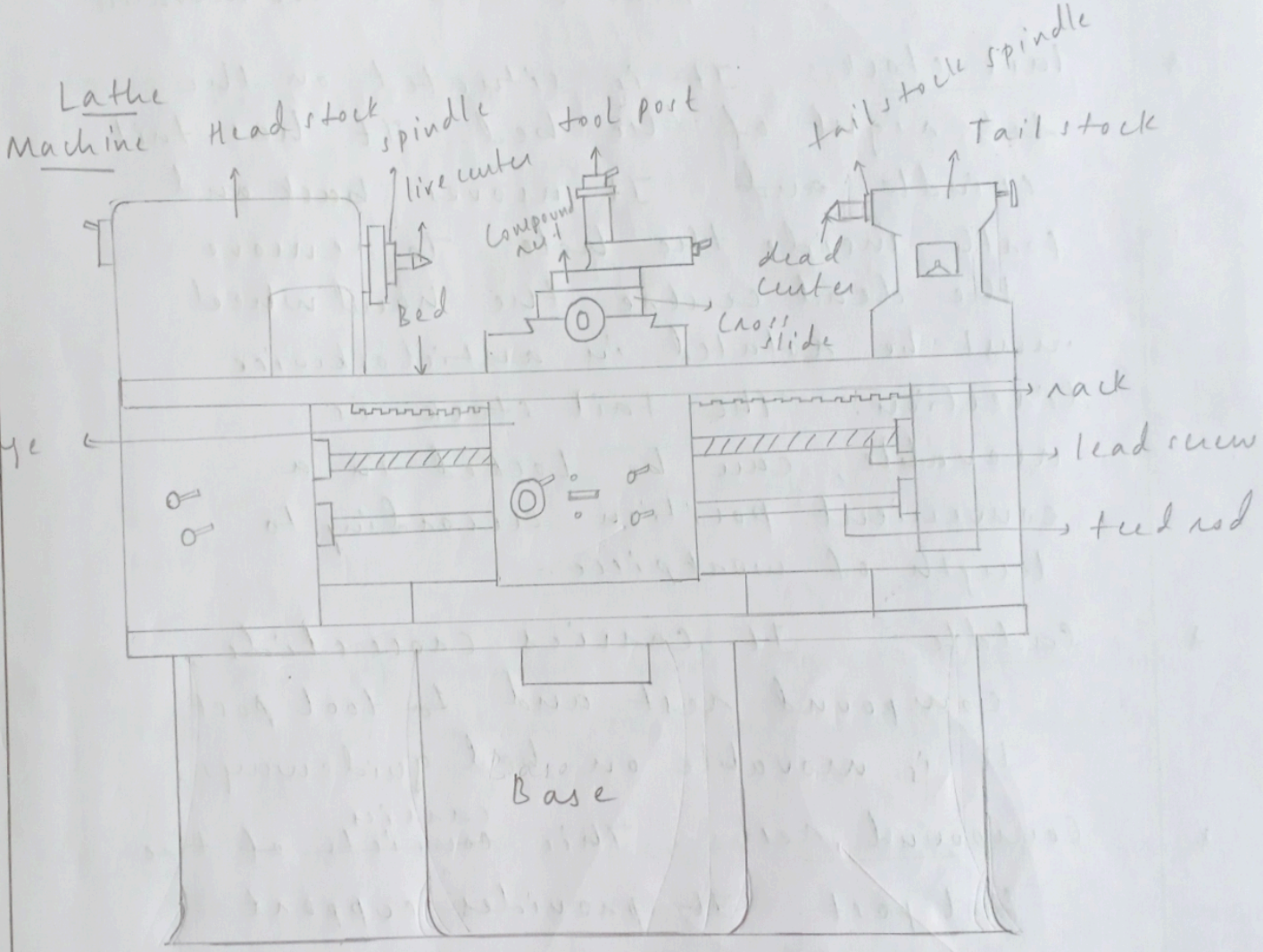
V_{mp} = cutting speed at maximum production.

T_{mc} = Tool life at minimum cost

T_{mp} = tool life at maximum production.

T_c = changing tool life.

2. Lathe Machine



Major parts of lathe :-

* ~~Bed~~ Bed :- It is the base which carries many other parts and is made of cast iron. It has head stock on its left, tail stock on its right and carriage blw head stock and tail stock.

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* Head stock :- It is situated on the left of the bed. It consists of a spindle and mechanism to drive the spindle. It is not movable.

* Tail stock :- It is situated on the ~~left~~ right of the bed. It has tail spindle ~~and~~. It moves back and forth inside the hole. To remove the dead centre the hand wheel must be rotated in anticlockwise direction. The tail stock is movable, can be locked in a convenient position according to length of workpiece.

* Saddle :- It carries cross-slide, compound rest and ~~to~~ tool post. It is movable on bed guideways.

* Compound rest :- This carries ~~consists~~ ~~of~~ the tool post. It provides support.

* Tool post :- It is situated on the compound rest. It gives support to the cutting tools and adjusts according to convenient working position and chooses the tools according to the operation to be performed

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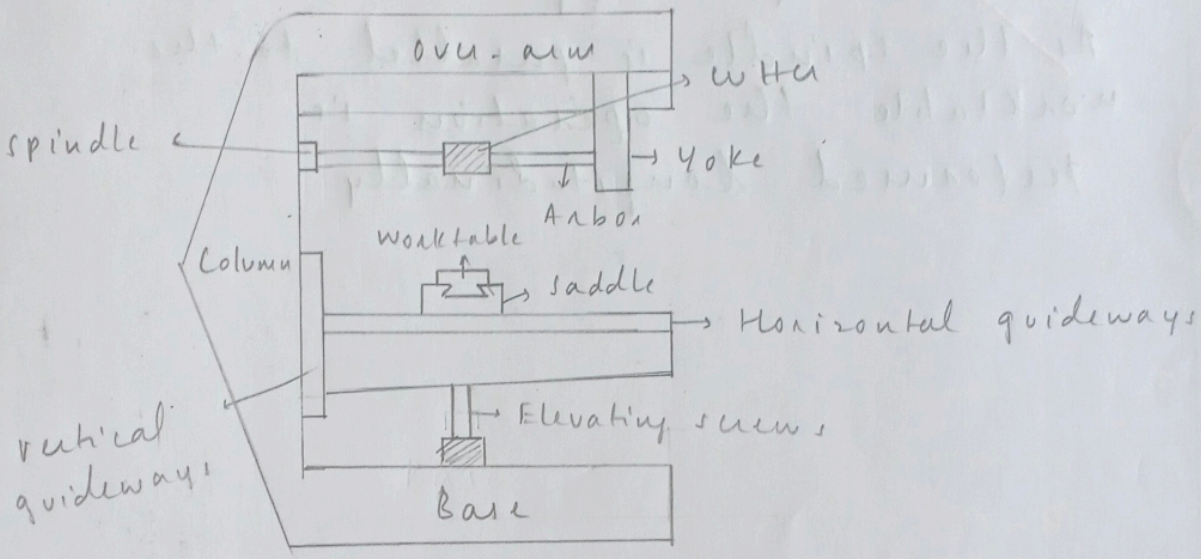
* Feed rod :- It is parallel to the lead screw. It controls the movement of tool feed. It moves back and forth.

4. Horizontal milling machine :-



→ It is a very robust and sturdy machine
→ It is used when vertical milling machine is less suitable.

Column :- It is the major supporting frame placed vertically on the base. It houses spindle and guideways.

Base :- It mounts all the other parts of milling machine. The elevating screw rests on the top of the base.

Over-arm :- It is mounted on top of the column beyond the length of it. It supports the arbor with the help of yoke.

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It has a base vertically supported by a column., over-arm on top of the column. Spindle parallel to the worktable. Elevating screw supporting the saddle. Vertical and horizontal guideways for movement.

As the spindle is parallel to the worktable the operation is performed longitudinally.

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Internal Assesment Test - IV

Sub:	METAL CUTTING & FORMING					Code:	18ME35A
Date:	19/03/2022	Duration:	3 hours	Max Marks: 100	Sem: III	Branch:	MECH

Answer Any **TEN** full Questions

		Marks	OBE	
			CO	RBT
1	Explain the steps involved in compound indexing method	10	CO2	L2
2	Explain with neat sketch major parts of lathe machines	10	CO1	L2
3	Explain the difference between turret & Capstan lathe	10	CO1	L2
4	Explain with the neat sketch horizontal milling machine	10	CO1	L2
5	Derive the conditions $2\phi+\beta-\gamma=\pi/2$. Explain its significance with usual notation.	10	CO3	L3
6	With a neat sketch, explain the various parameters which make up the tool signature of a single point cutting tool.	10	CO3	L3
7	With neat sketches, explain flank and crater wear.	10	CO2	L2
8	Explain with the neat sketch cylindrical grinding process	10	CO1	L2
9	Define tool life? Give the relation between tool life and cutting speed.	10	C04	L2
10	Define tool life. List out the factors that affect tool life.	10	C04	L2
11	Define tool wear and explain with neat sketch flank and crater wear	10	C04	L2
12	Derive the relations for choice of cutting speed and feed, tool life for minimum cost and production time	10	CO4	L3

13

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