Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any
equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. 1A	Attempt any Three	Marks
a) Ans :	**Describe setup of WJM with neat sketch**	01

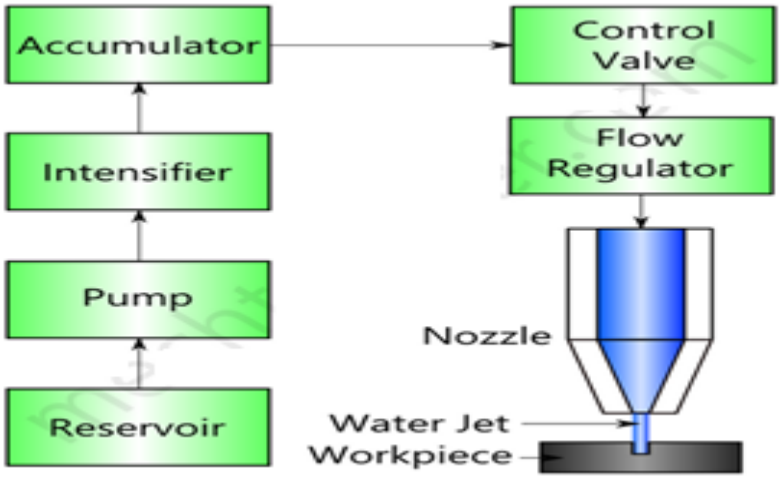


Fig. Construction of Water Jet Machining

The apparatus of water jet machining consists of the following components: 03

- **Reservoir:** It is used for storing water that is to be used in the machining operation.
- **Pump:** It pumps the water from the reservoir.
- **Intensifier:** It is connected to the pump. It pressurizes the water acquired from the pump to a desired level.
- **Accumulator:** It is used for temporarily storing the pressurized water. It is connected to the flow regulator through a control valve.
- **Control Valve:** It controls the direction and pressure of pressurized water that is

to be supplied to the nozzle.

- **Flow regulator:** It is used to regulate the flow of water.
- **Nozzle:** It renders the pressurized water as a water jet at high velocity.

b) Distinguish between absolute and incremental coordinate system of CNC. — 04 — 4 point

Absolute	Incremental
The coordinate will measured with respect to the origin of the co-ordinate system also called zero point.	The co-ordinate of any point is calculat reference to the previous point.
It Is easy to check and correct the program	It is difficult to check the part program incremental mode
The main advantage of the absolute system as compared with the incremental system , is in the case of interruption that force the operator to stop the machine	In incremental system, any time the w interrupted , before switching on agair operator must bring the tool manually exact place of the last operation occur
Almost all the point to point positioning system used absolute system.	Incremental system are not often used controlling point to point machine too
Absolute system is used for general program	Incremental system is used for canned loop and subroutine program.

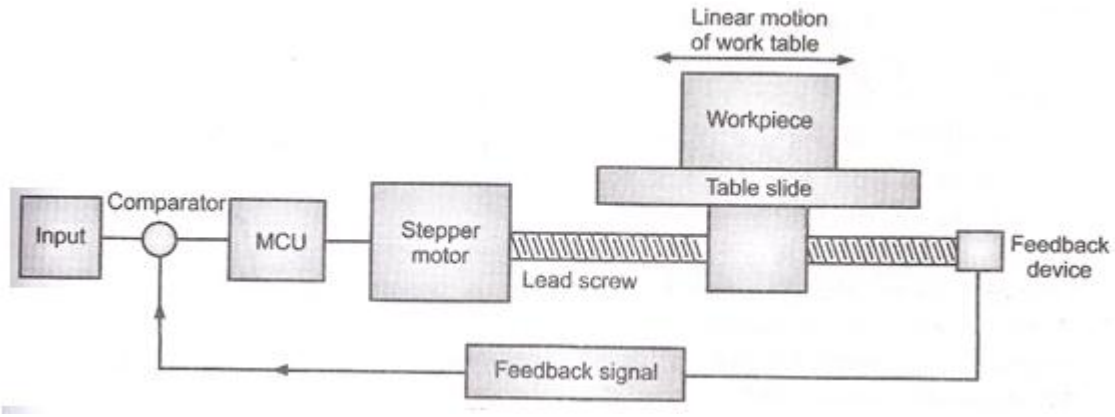
c) Compare pull broach with push broach. — 04 — 4 point

Pull Broach	Push Broach
This broach is pulled out of the work piece.	This broach is pushed through the piece.
It Is longer in the length than push broach.	It is comparatively shorter in lengt
It is used where a longer surface is to be broached.	It is used where a short length is t broached.
It carries more number of teeth.	It carries less number of teeth.
The pull broach is in tension.	The push broach is in comparison.

d) State need of non –traditional machining processes. — 04 — 4 point

1. The need to shape new metal alloys and non-metals that are difficult to machine by conventional processes.
2. The requirement of unusual and complex workpart geometries.

	3. The need to avoid surface damage which is often associated with conventional machining. 4. Any material can be machined irrespective of its hardness.	
Q1 B	Attempt any ONE	6 X 1
a)	**Explain controlling parameters in WEDM.** **1. Discharge current** - Material removal rate increases with current - Increasing the current increases the crater depth up to a certain value, beyond which increasing these parameters yield a smoother surface. - The wire being small cannot carry current more than 30A. **2. Pulse duration** - Increase in pulse duration results in more removal of material. - Increase in pulse duration results in reduced surface roughness. **3. Pulse frequencies** - Material remove increased with pulse frequencies. - The pulse frequencies is about 1 MHz. - This results in reduced crater size or better surface finish. **4. Wire speed** - The wire speed is in the range of 2. 5 to 150 mm /sec. - The cutting rate depends upon the thickness of the work piece. - The maximum depth of material that can be machined is about 90 mm. **5. Wire tension** - The appropriate wire tension should be maintained in order to keep the wire straight. - A series of tension rollers is provided to keep the required tensions. - The wire tension is 50 % to 60 % of its tensile strength. **6. Dielectric flow** - A nozzle is employed to inject the dielectric fluid in the machining area. - The supply of dielectric should be continuous and enough to allow the sparking. - The dielectric fluid can be reused, but only after filtration.	6 6 point

b)	**Explain the closed loop control system with block diagram and state functions of each element.**  The name indicates that the closed loop control system has a loop that is closed as shown in fig. A feedback device is used for this purpose. This makes the design of closed loop a little complicated and expensive. But a very high degree of accuracy is achieved in the movement of slide. This system is similar to open loop control system. But it consists of two additional devices in the form of feedback transducer and a comparator as shown in Fig. The transducer feedbacks the actual slide displacement to the comparator. The comparator compares the actually achieved slide movement with command signal. If there is any error then it is feedback to the MCU. The MCU then sends the corrective commands to the drive unit and the cycle repeats until there is no error signal from the comparator.	02 04
Q.2	**Attempt any FOUR**	4X4
a)	**How laser beam is used for welding?** • The beam is targeted on the workpiece surface which is to be welded. • At the surface, the large concentration of light energy is converted into thermal energy. • The surface of the workpiece starts melting and progresses through it by surface conductance. • For welding, the beam energy is maintained below the vaporization temperature of the workpiece material. • Concentrated energy produces melting and coalescence before a heat affected zone is developed. • The role of focusing lenses in this process is really important because it concentrates the beam energy into a focal spot as small as 0.005 in diameters or even less. • Because the penetration of the workpiece depends on conducted heat, the thickness of the materials to be welded is generally less than 0.80 inches.	04

- When the materials to be welded are thick and have high thermal conductivity like for example aluminium the advantage of having a minimal heat affected zone can be seriously affected.
- Because the heat source in this type of welding process is the energy of light, the workpiece will be welded purely which means the fatigue strength of the welded joint will be excellent.
- The function of all laser beam welding processes whether they be gas (carbon dioxide, helium, neon etc.) or other lasing sources is based on the principles of the excitation of atoms using intense light, electricity, electron beams, chemicals etc., and the spontaneous and stimulated release of photons.

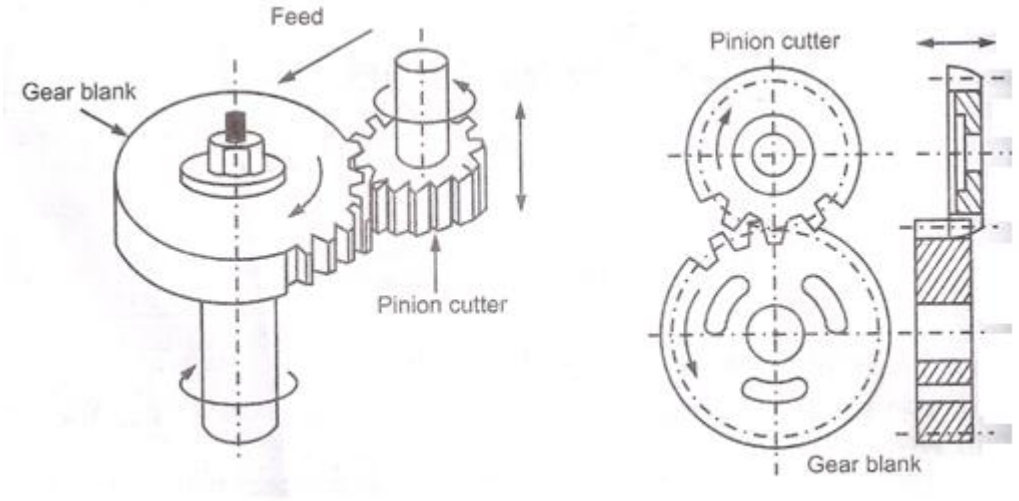
b) Explain the use of following codes in part programing : G95 , G41 , M06 , M98 — 04

Codes in part programing	Use
G95	Feed rate in mm/min (mm/rev)
G41	Cutter diameter compensation left
M06	Tool Change
M98	Call Subroutine

c) Compare plain milling machine with universal milling machine. — 04 4 point

Plain Milling Machine	**Universal Milling Machine**
1. The table of plain milling machine has three movements cross, longitudinal and vertical.	**1.** The table of universal milling machine has 4 movements i.e. cross, longitudinal, vertical and swivelling.
2. Helical milling cannot be performed without using a spiral milling attachment.	**2.** No such attachment is required.
3. It is more rigid and heavier in construction.	**3.** It is less rigid and light in construction.
4. Its overarm is fixed.	**4.** Its overarm can be pushed back or removed and a vertical milling head can be fitted in place of the arbor to use it as a universal milling machine.
5. It is particularly adopted for manufacturing operation.	**5.** It is mostly intended for tool room work.
6. No auxiliaries are provided.	**6.** Various auxiliaries are provided.

d) Explain with neat sketch Pinion cutter gear shaping process. — 02



02

- In this method instead of rack cutter a pinion cutter havening formed similar to gear to be produced is used
- The pinion cutter reciprocates along vertical plane. Gear blank is mounted on a vertical shaft and rotates very slowly.
- The depth of cut is given during the cutting stroke (Downword stroke) and during return stroke work is relieved and cleared from cutter.
- During the process the cutter is fed radially to the gear blank to obtain required tooth depth.
- The use of pinion makes the process continuous and rate of production is more.

e) a) Describe contents of maintenance manual. 04

The contents of a maintenance manual vary from machine to machine.

But in general the maintenance manual contains the following chapters

1. Maintenances procedure
2. Maintenances requirement
3. Safety Precautions.
4. General notes on handling.
5. Troubleshooting.
6. Limitations to warranty
7. Abbreviations
8. Index

Q 3 a) CNC Part Program **8Marks**

Neglecting cutter radius compensation

G90 G54 G94; ----------G54 – work offset

M03 S1000 T01 M08;

G00 X0.0 Y0.0 Z5.0;

G01 Z-2.0 F50;

G01 Y60.0;

G01 X15.0 Y75.0;

G01 X75.0;

G01 Y15.0;

G02 X60.0 Y0.0 R15.0;

G01 X0.0 Y0.0;

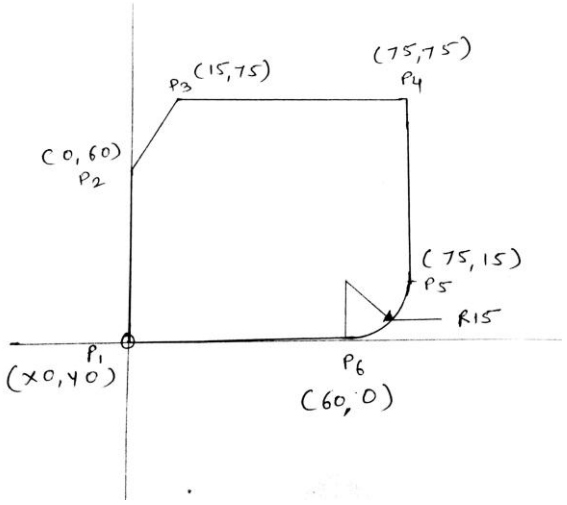
G01 Z5.0;

M05 M09;

M30;

NOTE:-ABOVE PROGRMME CAB BE WRITTEN USING BLOCK NO. AND EOB.

PROGRAMME WITH DIFFERENT STARTING POINT AND WITH DIFFERENT LOGIC SHOULD BE GIVEN FULL MARKS



Q-3 b) Suitable nontraditional machining process for particular application (2*4=8 Marks)

i) Machining the profile of the glass- 2 Marks

Abrasive Water jet machining is most appropriate as glass is brittle and with the AWJM the doing perfect machining with the help of sharp edges of abrasive metal particles

ii) Cutting of hot extrusion components.

Electric discharge machining is used for Cutting of hot extrusion components and dies.

2 Marks

iii) Cutting internal threads in hard materials- Internal threads can be done with electrical discharge machined (EDM) into hard materials by complexity of components. 2 Marks

iv) Cutting and engraving patterns in the thin films-Laser beam machining is most suitable to engrave the patterns in the thin films which is done by focusing all the energy with the help of laser.
2 Marks

Q-3 c) Compound Indexing

8marks

3-c - Compound indexing (BN = 1+1+3) (4)

It consists of two operations.

(1) To turn the index crank through a required amount.

(2) To turn the index plate and crank both either in same or reverse directions thus adding or subtracting the further movement.

Rule for compound indexing is

$$\frac{40}{N} = \frac{n_1}{N_1} \pm \frac{n_2}{N_2}$$ → 01 Marks

where, N = No. of divisions required
N_1 = holes used by crank pin
N_2 = holes used by lock pin.
n_1 = hole spaces moved by crank pin in N_1 hole circle
n_2 = hole space moved by plate and crank pin in N_2 hole circle.

Thus, procedure for compound indexing is as :-

1. Resolve into factors the no. of divisions required
2. choose at random two hole circles
3. subtract the hole no. from one circle from another.
4. factor the difference
5. place the factors of divisions required & the factor of difference in horizontal line,
6. factor the no. of turns of the crank required for one revolution of spindle (40) & also factor of hole circle choosen.

(7) place these new factors below in horizontal line.
(8) cancel common factors above and below the line.
If all factors above the line can be cancelled by those placed below then the two circle chosen can be used for indexing otherwise choose two another circle for next trial.
(9) the factors which will remain uncancelled below the line should be multiplied by to obtain the spaces in the hole circle moved by two indexing movements. → 04 Marks

Ex :- Indexing of divisions by compound indexing
ist. - above 9 steps with ex

(i) $69 = 23 \times 3$
(ii) index circle :- 23 & 33 are chosen
(iii) $33 - 23 = 10$
(iv) $10 = 2 \times 5$
(v) $69 = 23 \times 3$
$10 = 2 \times 5$

(vi) $40 = 2 \times 2 \times 2 \times 5$ — factor the no of turn for one complete revolution spindle

(vii) $69 = 23 \times 3$
$10 = 2 \times 5$
$40 = 2 \times 2 \times 2 \times 5$
$23 = 23 \times 1$
$33 = 3 \times 11$

→ All the ~~circle~~ factors are above line cancelled thus 23 & 33 can be used for indexing.

(viii) Multiply uncancelled factor below base line,
$2 \times 2 \times 1 \times 11 = 44$.
Thus 44 is no. of holes used for indexing with $N_1 = 23$ & $N_2 = 23$ then.

$$\frac{40}{N} = \frac{N_1}{N_1} \pm \frac{N_2}{N_2}$$

$$\frac{40}{69} = \frac{44}{23} - \frac{44}{33}$$

$$= \left(1\frac{21}{23} - 1\frac{11}{23}\right)$$

$$= \frac{21}{23} - \frac{11}{33}$$

hence index crank should be moved by 21 holes in
(i) 23 hole circle forward

(ii) plate and crank is together moved by 11 hole in 33 hole circle in backward direction
→ 03 Marks

Q- 4 A- a)T Slot milling cutter

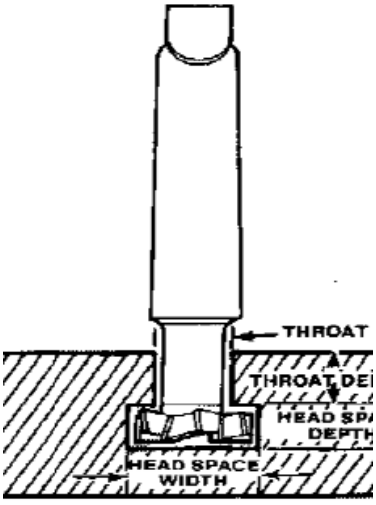


Fig T SLOT 1 MARKS

Use-To produce the T shape milled slots. 1Marks

Slab Milling cutter- Slab mills are used either by themselves or in gang milling operations on manual horizontal or universal milling machines to machine large broad surfaces quickly.

2 marks- 1 for sketch and 1 for Use

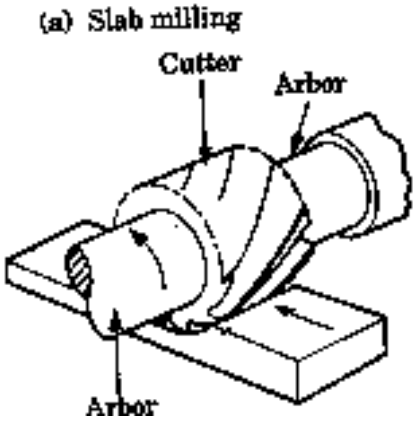


Fig-Slab Milling Cutter

Q-4 A- b-Gear Manufacturing Processes are classified as per (1+1+2=4Marks)

I) based on the material removal process also called gear manufacturing with generating methods. 1Mark

1) By the rotary wheel-milling with disc and end mill cutters.

2) By Rotating thread wheel-Gear hobbing.

3) By reciprocating /rotary tolls like gear shaping with rack cutters & pinion cutters and with single point cutting tools.

II) With the forming

1) Cold Drawing

2) Gear Rolling.

III) With Casting

1) Die casting

2) Investment casting

3) Sand Casting.

IV) Gear making withy the powder metallurgy 2Mark

Q-4-A c) Various aspects of safety for grinding are 4 Marks

1) Operator should always use safety devices such as goggles & aprons to protect his eyes and body from the flying abrasive particles and dust.

2) Wheel should be checked for the damage in the transit, cracks and other tests. Sound wheel when tapped lightly sound clear while crack wheel will not ring this is called ring test on grinding wheel.

3) Wheels not in used should be stored in dry place & placed on their edges in racks.

4) Wheel should be correctly mounted in the spindle and enclosed by the guards

5) Wheel speed which is dependent on bursting strength, grit size, bond, structure etc and is usually specified by the manufacturers should not be exceeded in order to avoid the accidents.

6) Do not tighten the flange bolts excessively in order to avoid the cracking of the wheel.

7) During wet grinding the wheel should not be partly immersed in order to avoid out of balance of the wheel.

8) Ensure adequate power supply during grinding operation in adequate power may cause out of balance of the wheel

Q-4-A-d) To Index 83 divisions with differential Indexing

(i) Gear ratio

(ii) Gear ratio = $\frac{(A-N)\times 40}{A}$

Assume A = 86 a number almost equal to 83 and can be indexed by plain indexing

Gear ratio = $\frac{(A-N)\times 40}{A}$

$= \frac{(86-83)\times 40}{86}$ → 1 M

$= \frac{3\times 40}{86}$

$= \frac{72}{24} \times \frac{40}{86}$.

∴ driver gear = 72, 40

driven gear = 24, 86

(i) No. of idler gear

(A-D) = (86-83) = 3 → positive

1M and gear ratio is compound so, no idler gear is ~~used~~ required.

(ii) Index crank movement

$\frac{40}{86} = \frac{20}{43}$

1M for Complete indexing the index crank have to move by 20 holes in 43 hole circle for 83 times.

iv) Compound Gear train

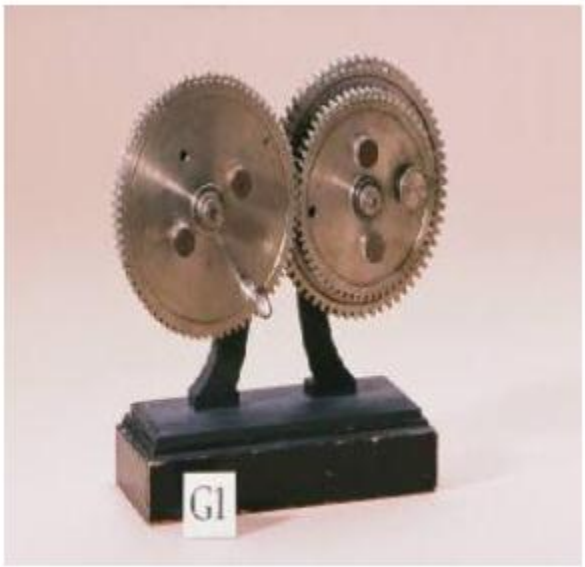


Fig- Compound Gear train

Q 4 B-a) Straddle milling with hexagonal **(4+2=6 Marks)**

-This is similar to the side milling operation. Two side milling cutters are mounted on the same arbor.

-Distance between them is so adjusted with the help of spacing collars such that both sides of the work piece can be milled simultaneously.
Hexagonal bolt can be produced by this operation by rotating the work-piece only two times as this operation produces two parallel faces of bolt simultaneously. 4 marks

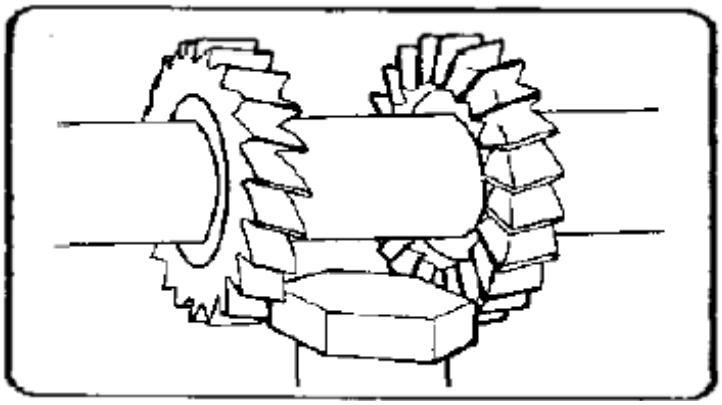


Fig-Straddle milling for hexagonal bolt manufacturing 2 marks

Q 4 B-b) Centre less Grinding (2+1+1+1+1=6 Marks)

-When the work piece is supported by the centers between grinding wheel regulating wheel by work rest blade then it is called as the centre-less grinding. In this both wheel rotate in the same direction and the rotation of the grinding wheel force the work piece on the work-rest blade against the regulating wheel.

-The regulating wheel controls the speed of work and longitudinal feed movement. 2Mark

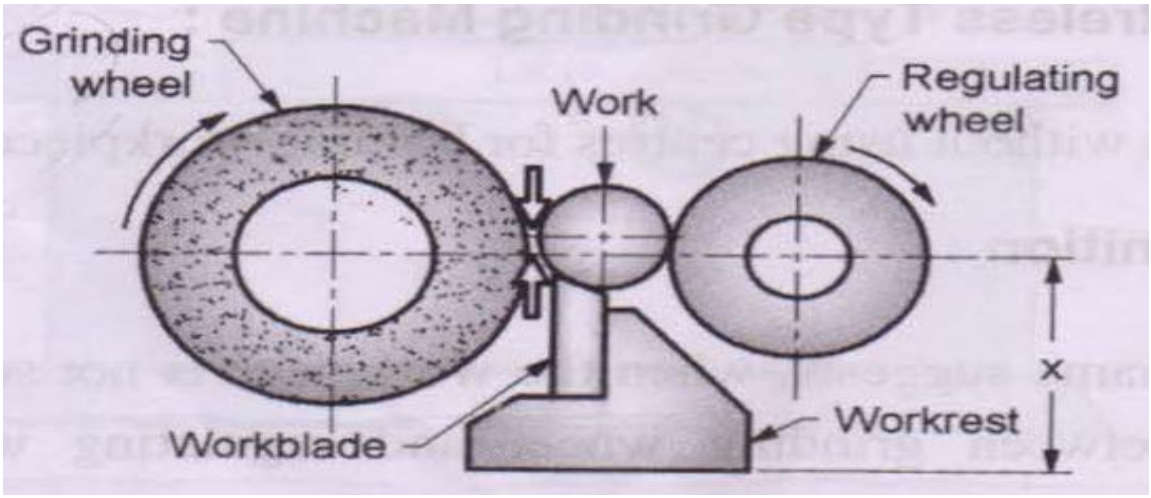


Fig-Centre-less Grinding

Methods of Feed in the centre-less grinding are

1) Through Feed

2) In Feed

3) End Feed 1 Mark

1) Through Feed- 1 Mark

-It is the simplest method and is applied only to the plain parallel parts such as roller pins and straight long bars.

- In this, controlling wheel is first positioned for the proper diameter i.e. the gap between the regulating wheel and grinding wheel is adjusted equal to the diameter of the work-piece and then job is fed and passed through the wheels.

-The Rate of longitudinal feed is =Π*Diameter of regulating wheel * SinΘ where SinΘ is angle of inclination of regulating wheel which is usually 1^0 to 6^0 .

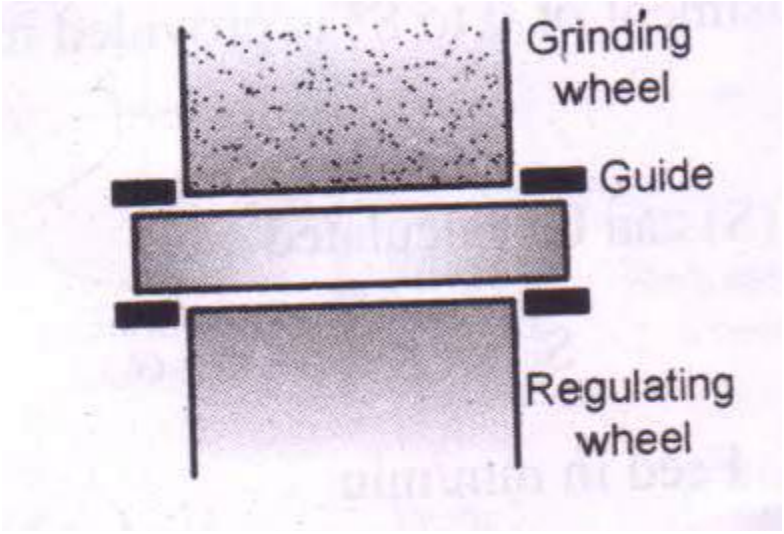


Fig-Through Feed

2) In Feed 1 Mark

-In the method there is no axial movement of the work-piece, the only movement is the rotating movement.

-During the process the work-piece is placed on the work rest against an end stop and then the control wheel is advanced towards the grinding wheel by some lever arrangement.

- The regulating wheel is given slight inclination of $(1/2)^0$ in order that work piece remain tight against the end stop.

-The length of work-piece that can be ground is 30cm by this process. Form grinding is also possible with this method.

-This method is used when work-piece is of heated, stepped or taper form.

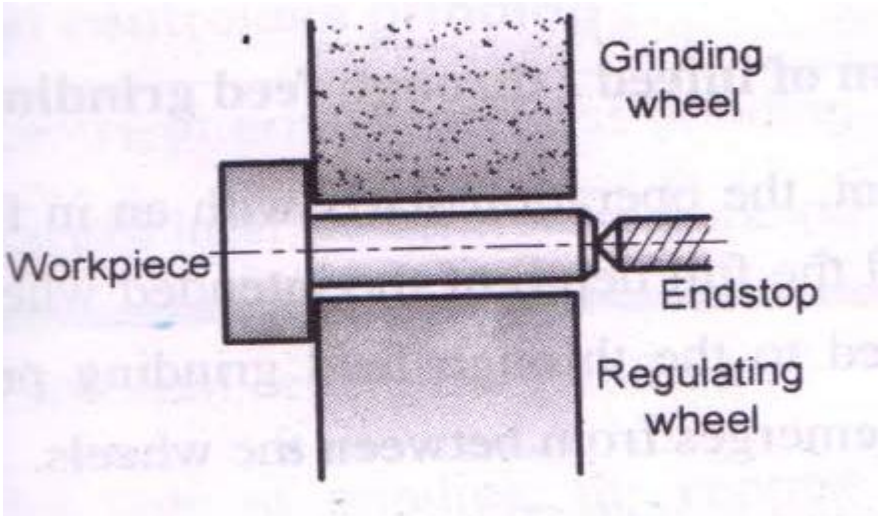


Fig-In feed

3) End Feed 1 Mark

-The work-piece is fed as in case of in feed method and after certain portion of length of work-piece has been ground ,the axial movement takes place until whole length has been ground.

-It is used for the headed components which are too long to be ground by in feed method.

-It is also used for the tapered work, usually both grinding wheel and regulating wheel are trued to obtain the required taper.

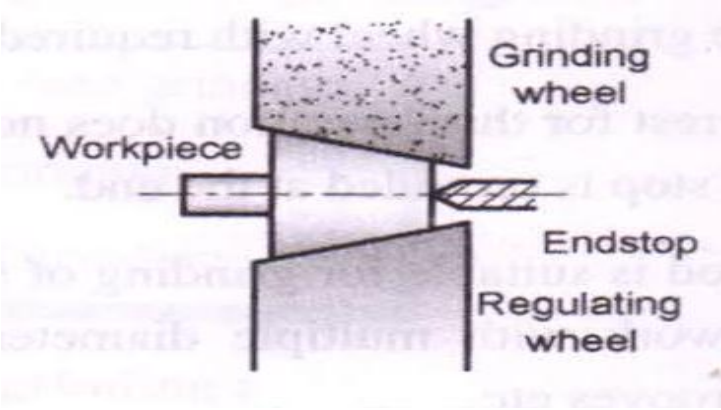


Fig-End Feed

Question No. 5 Attempt any Four (04 marks each)

[a] Prepare a sample history card for the milling machine. State its importance.

04 Marks = 03 Marks for History card and 01 for its importance.

Machine History Card	
Logo of Company	**Name of Company**
Department/Shop : *Machine Shop*	**P. O. No./ Date:**
	Machine Cost:

Make: *HMT*			**Machine No**. : *ML 01*		
Date	**Details of Fault**	**Action**	**Time Taken**	**Remark**	**Sign**
01.12.2015	*Lack Of Lubrication*	*Oiling*	*20 Min.*	*Ok*	
10.12.2015	*Belt Broken*	*Replaced*	*01 Hr.*	*Ok*	
Checked By, Name:_____ Sign Date: _____			Approved by, Name: _____ Sign Date:_____		

Importance of Machine History Card: This card gives you the detailed information about the previous maintenance done on the machine with respect to date of repair etc.

[b] Explain each term of grinding wheel designation: W A 46 K 5 V 17.

W- Prefix. (Manufacturer's Symbol)(Optional)

A - Abrasive type is Al_2O_3.

46- Abrasive Grain size is Medium.

K- Grade is Medium.

5 – Structure is dense

V – Type of Bond used is Vitrified.

17 - Suffix. (Manufacturer's Symbol)(Optional)

Correct answer 4 marks

Q. 5. [c] What is gear finishing? State the need for gear finishing.

Gear Finishing:

It is a process of removing or clearing out the irregularities from the flank of the gear, where the teeth come in contact with each other during meshing.

Need for Gear Finishing:

(1) For smooth running, good performance and long service life.

(2) To achieve accurate dimensions and form.

(3) To achieve hard and wear resistive area at tooth flanks.

(4)To remove inaccuracies produced through gear generating process.

04 marks = 02 gear finishing definition and 02 marks for need.

Q. 5. [d] Basic Parts of Column and Knee Type Milling Machine and their functions:

1) **BASE:** To support all the parts of milling machine.

2) **COLUMN:** To support Spindle and drive mechanism.

3) **KNEE:** Can be moved vertically up and down on column by using elevating screw.

4) **OVER-ARM:** To support other end of the arbor.

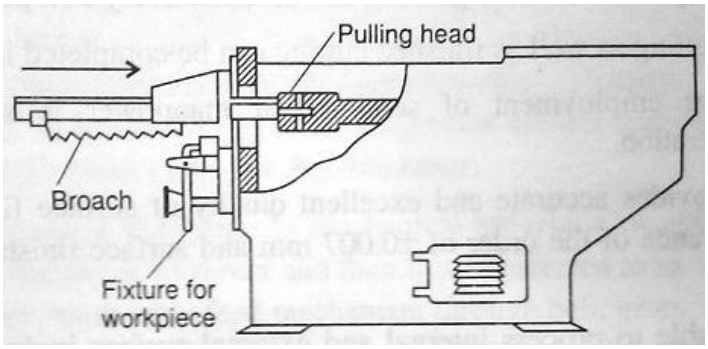
5) **SADDLE:** To move horizontally towards the column and away from column.

6) **TABLE:** To move towards the left and right of operator and to clamp the work-piece with T- slots on it.

7) **SPINDLE:** To hold rotary milling cutter.

List of parts= 01 Marks and the function of any four part=03 Marks

Q. 5. [e] Draw labeled sketch of horizontal broaching machine and state function of any four parts.

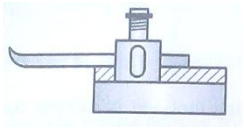


(1) BED: To support all the other parts of the machine, like drive mechanism, broach, pulling head and fixture etc.
(2) DRIVE MECHNISM: Used to pull or to push the broaching tool through the workpiece.
(3) BROACH: A cutting tool used to cut workpiece.
(4) FIXTURE: Used to hold the workpiece to be machined.
(5) PULLING HEAD: Used to transmit motion to the broach from piston rod of hydraulic cylinder.

Sketch= 02 marks and Function of four parts =1/2 marks each

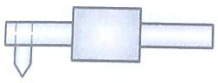
Q. 5. [f] List the type of boring tools and explain any two with neat sketch.

(1) Light Boring Tools (2) Forged Boring Tools.(3) Boring Bar (4) Double Ended Boring Tool (5) Multiple Edged Boring Tool (6) Counter Boring Tool.

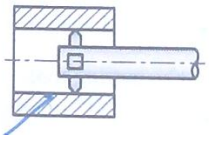


[a] Light Boring Tool

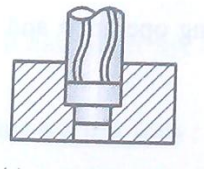
[b] Forged Boring tool



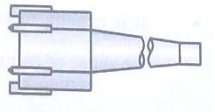
[c] Boring Bar



[d] Double ended Boring tool



[e] Multiple Edges Boring Tool



[f] Counter Boring Tool

[a] Light boring tool: A single point tool suitable for finishing operations.

[b] Forged Boring tool: Forged and grounded to the required shape of cutting tool.

[c] Boring Bar: A boring bar is used to hold the single point cutting tool, having ranges of diameter according to the required hole diameter.

[d] Double ended Boring tool: It is used roughing operation. Diameter of hole= Diameter of tool.

[e] Multiple Edges Boring Tool: In this boring tool, nos. of inserted tooth cutters mounted on periphery of tool.

[f] Counter Boring Tool: A multipoint cutting tool used to enlarge one end of pre-drilled hole upto the required depth.

List of Boring Tools= 01Mark , Sketch= 01 Mark each, Explanation= ½ Mark each

Question No.6 Attempt any Four (04 marks each)

Q.6 [a] Compare gear burnishing with gear grinding.

S.N.	GEAR BURNISHING	GEAR GRINDING
1	The workpiece gear is mounted on a vertical reciprocating shaft in contact and under pressure with three hardened burnishing gears.	The workpiece gear is mounted on indexing head in contact with the formed and dressed grinding wheel/wheels.
2	All the teeth of gear are finished at a time	Teeth are finished one by one
3	Quicker process.	Slower process.
4	New method of gear finishing	Old method of gear finishing
5	It is process of finishing gear, before hardening	It is process of finishing gear, after hardening
6	Less accurate	Highly accurate
7	Cheaper than gear grinding	Costlier than gear burnishing.
8	After burnishing gear surface have smear metal	After grinding gear surface have small scratches.

Any Four points 1 Mark each.

Q. 6. [b] Differentiate between planer and planomiller.

S. N.	PLANER	PLANOMILLER
1	Single point cutting tool is used for	Multi point cutting tool is used for cutting

	cutting the workpiece.	the workpiece.
2	Tool is stationery.	Tool is rotating.
3	It can cut the workpiece during forward stroke of table only	It can cut the workpiece during both, forward and return stroke of table
4	Highly skilled operator is required	Semiskilled operator can be operate this machines.
5	Slower as single point cutting tool is used.	Faster than planer as multi point cutting tool is used
6	Different Tools are required as per the shape of job.	Single cutter can be used for nos. of jobs.

Any four points 01 mark each

Q.6. [c] Describe maintenance practices for gears.

Maintenance Practices for Gears:

1) Select the proper gear.
2) Select proper raw material for manufacturing of gear.
3) Do the balancing of gear properly.
4) Do the proper alignment of gear on shaft and key.
5) Check the alignment of gear with its meshing gear.
6) Check the lubrication and change the oil on specified intervals.
7) Minor repairs like burr or imperfections can be cleared by using a fine oil stone or file.
8) If major repair is required remove the gear from assembly, repair it and assemble.

Correct answer= 04 marks

Q.6. [d] State applications of broaching.

Applications of Broaching: Broaching is used for manufacturing of

1) Hand tools like Pliers, wrenches, etc.
2) Automobile components like clutch pressure plate, gear splines, gear sectors, rocker arms etc.
3) Aircraft components like jet engine plates, key ways,
4) Special gears, bushings, sprocket teeth, etc.

Any four applications = 01mark each

Q.6 [e] Give the maintenance practices for bearings and chains of machines.

[1] Maintenance Practices for Bearings:

(i) Never spin the bearing with compressed air.

(ii) Do not try to disassemble the bearing.

(iii) Avoid direct fire or fumes contact with bearing.

(iv) Do not hit the bearing with metal part/use bearing pullers while assembling or dismantling.

(v) Store the bearing away from moisture.

(vi) Check the clearance between bearing cap and bearing using plasti gauge before assembly.

(vii) Do not run the bearing over its specified speed.

(viii) Do not throw away broken bearing, it may help you to know type of failure for corrective actions.

[2] Maintenance Practices for Chains:

(i) Use covers on chains to avoid entry of foreign material.

(ii) Check alignment.

(iii) Inspect chain flexibility.

(iv) If amount of stretch is greater than 3% of its original length, then single pitch rollers should be changed.

(v) Lubricate chain properly and periodically.

(vi) Check for any physical damage of chain/s.

(02 Marks for Gear Maintenance and 02 Marks for chains Maintenance Practices)