AKGEC GHAZIABAD

DEPARTMENT OF MECHANICAL ENGG.

ST-2 SOL Odd 17-18

NME-503

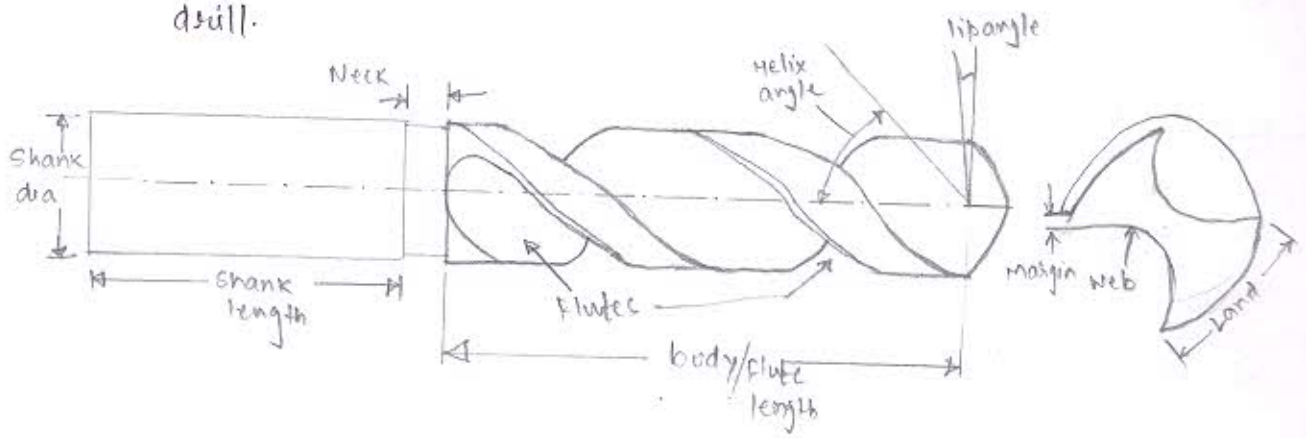
SECTION-A

Q-a). Distinguish between up-milling and down-milling.

Soln:-

up milling	down milling
(1) Workpiece is fed in the opposite direction that of the cutter	(1) work piece is fed in the same direction that of the cutter
(2) Chips are progressively thicker	(2) chips are progressively thinner
(3) Strong clamping is required since the cutting force is directed upward & tend to lift the workpiece	(3) Strong clamping is not required since the cutting force is directed downwards and keep the workpiece pressed to the table.
(4). Gives poor surface finish, since chips gets accumulated at the cutting zone	(4) Gives good surface finish, since the chips are thrown away during cutting.
(5) Used for hard materials	(5) used for soft materials and finishing operations.

Q-b). With the help of neat sketch, describe the geometry of twist drill.



Q-c). Differentiate between capstan and turret lathe.

Soln:

Capstan lathe	Turret lathe
(1) Capstan lathe generally deal with short or long rod type blank held in collet	(1) Turret lathe are relatively more robust and heavy duty machine.
(2) In capstan lathe, the turret travels with limited stroke length within a saddle type guide block, called auxiliary bed, which is clamped on the main bed	(2) The heavy turret being mounted on the saddle which directly slides with larger strokes lengths on the main bed.
(3) External screw threads are cut in capstan lathe, if required, using a self opening die being mounted in one face of the turret	(3) One additional guide rod or pilot bar is provided on headstock of the turret lathes to ensure rigid axial travel of the torrent head.

Q-d). Differentiate between planing machine and shaping machine.

Soln:

Planing Machine	Shaping Machine
(1) These are ~~heavy~~ light in construction	(1) Light construction
(2) More floor area	(2) Require less floor space area
(3) Tool stationary, workpiece move	(3) Tool reciprocate, the work-piece is stationary
(4) Quite massive	(4) Shaper tool are simple
(5) More than one tool can be use	(5) only one tool use
(6) Maximum accuracy obtained	(6) Perfect accuracy is not obtain
(7) It is adopted for large work	(7) Adopted for small work.

(8) Used for mass production	(8) uses for batch or job shop production
(9) cost of machine is high	(9) cost of machine is less.

Q-e) List different tool holding mechanisms of a lathe, write short notes on them.

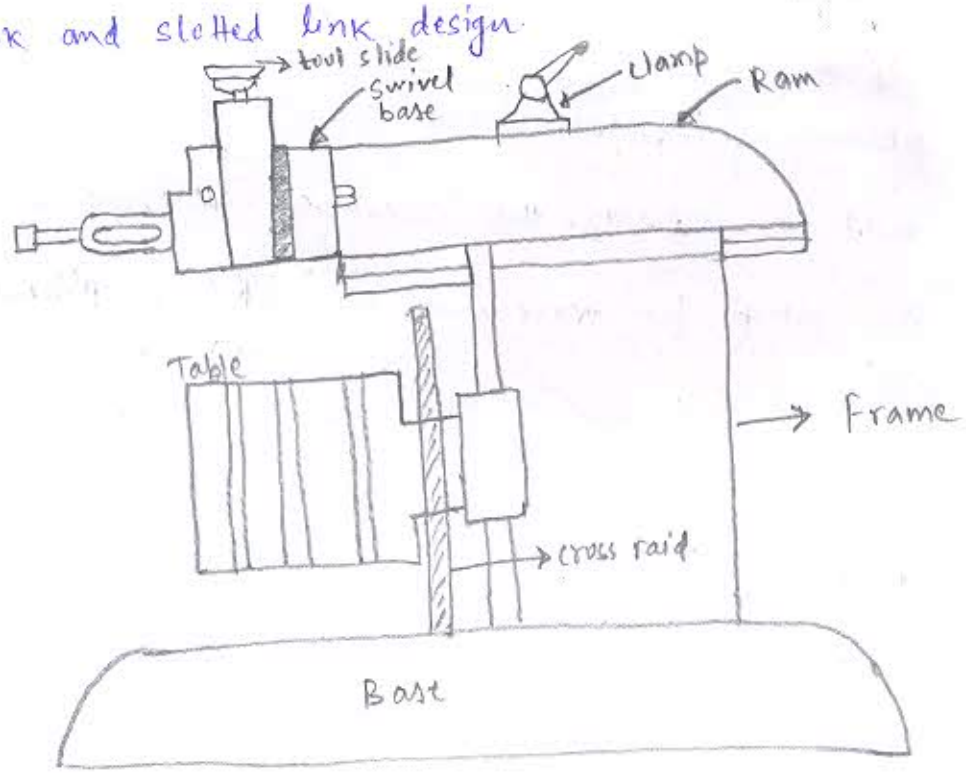
(1) Tail-stock: The tailstock casting rides on the way and is locked in place by means of a nut and wrench. The tailstock is a tool holder directly mounted on the spindle axis, opposite the head stock. The spindle does not rotate but does travel longitudinaly under the action of lead screw and hand wheel.

(2) Tool post: The tool post can hold up to four tools at once, each locked in place by hexagonal-head cap screw. Tool post is mounted on the cross-slide and compound and cross-slide & compound ~~are~~ is mounted on carriage which is move either by manual, or automatic. Automatic feed of carriage is given by the lead screw. on the carriage all controlled device are setup for movement in different position.

Section-B

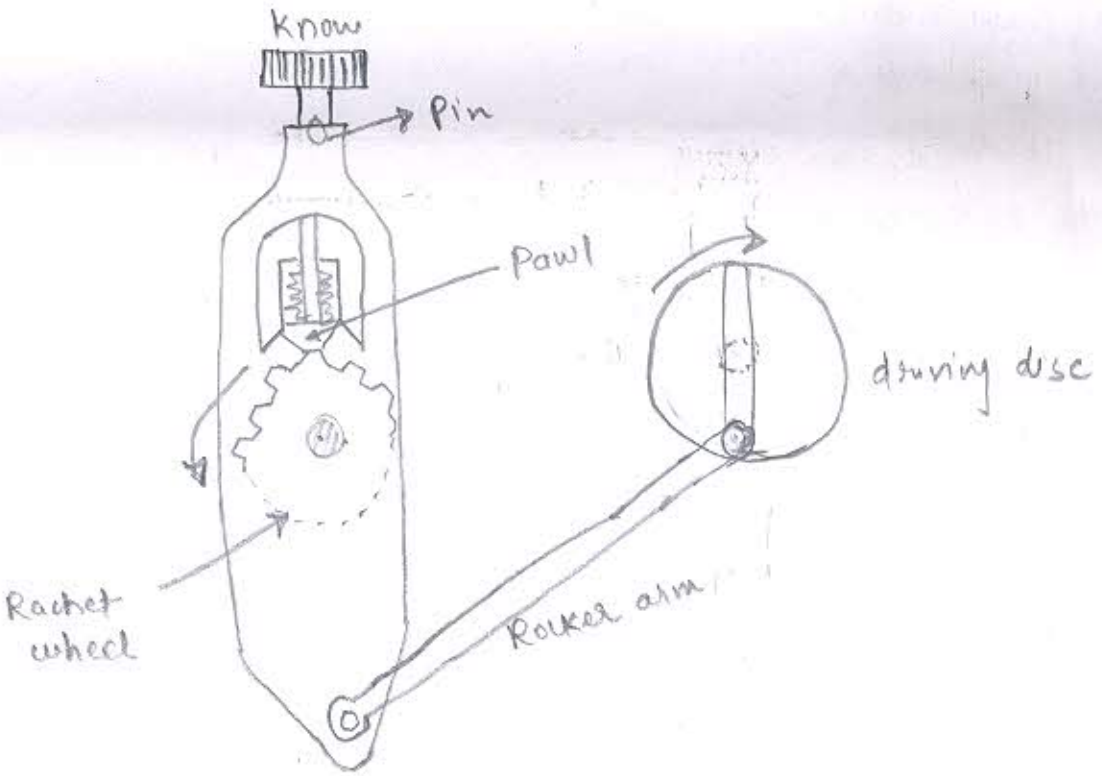
Q-a). Sketch and explain the working Principle of a shaper. How is the feed obtained on a shaper?

Soln:
- The job is rigidly fixed on the machine table
- The single point cutting tool held properly in the tool post is mounted on a reciprocating ram
- The reciprocating motion of the ram is obtained by a quick return motion mechanism
- As the ram reciprocates, the tool cuts the material during its forward stroke. during return stroke, there is no cutting action and this stroke is called the idle stroke.
- The forward and return strokes constitute one reciprocating cycle of the shaper.
- In order to reduce the time wasted during the return non-cutting stroke, shaping machines are fitted with a quick return mechanism, usually of the crank and slotted link design.



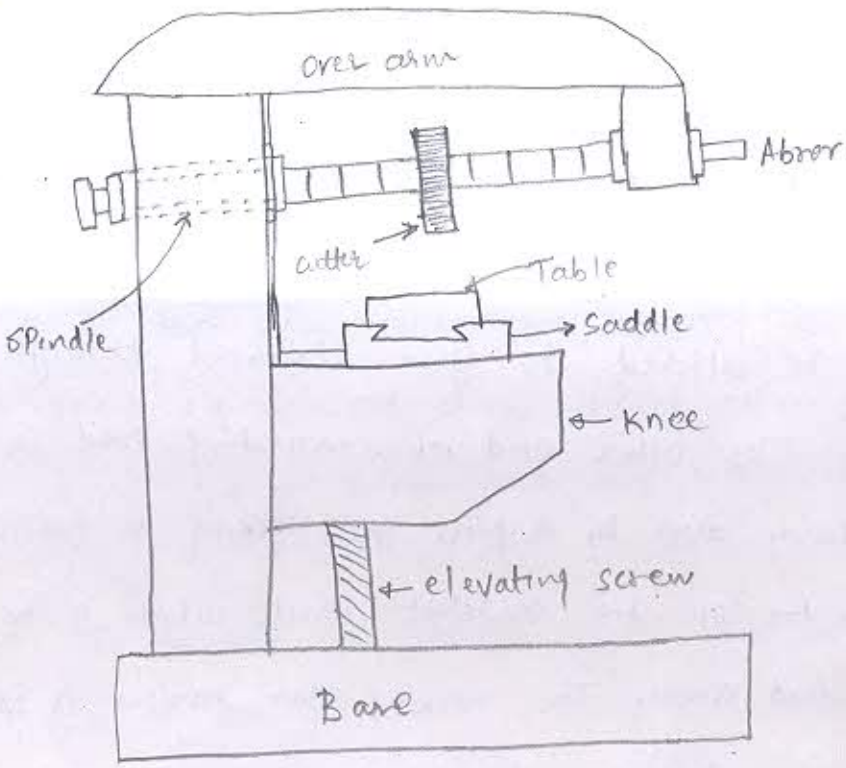
Feed mechanism of shaper:

The purpose of table feed mechanism is that when the ram is moving back i.e. in an idle stroke the table should be cross-fed so that next time the tool takes cut in different line. This is done either manually or automatically The rotation of bull gear causes the driving disc to rotate in particular direction. The driving disc is T-slotted and position of the crankpin attached to the connecting rod may be altered, to give different through of eccentricity. The other end of connecting rod is attached to the rocking arm by a pin. The rocking is fulcrumed at the centre of the ratchet wheel, which is keyed to The cross feed screw. The rocking arm houses a spring loaded pawl, which is straight on one side and bevel on the other side.



Q-b. Draw schematic sketch of horizontal milling. List different type of operations performed on a horizontal milling machine.

Soln:



List of Operations:

(a) Saw cutting
(b) Plain cutting
(c) Helical, plain cutting
(d) Saw, slotting cutting
(e) Side mill, slotting cutting
(f) Half side, straddle cutting
(g) Single angle cutting.
(h) Double angle cutting
(i) Concave cutting.
(j) Convex cutting
(k) Corner rounding
(l) T-slot
(m) male thread

(n) female thread.

(o) Form milling

(p) Gear cutting

Q-c) What do you understand by boring? What is the difference between lapping and boring process.

Soln: Boring is a controlled, low-velocity, stock removal process that uses fine abrasive stones to remove very small amounts of metals. The cutting speed is very slow in comparasion to grinding. The process is used to size and finish bored holes, remove common errors left by boring or remove the tool mark left by grinding. Although boring occasionally is done by hand as, in finishing the face of cutting tool, it is usually done with special equipment. Mostly borning is done on internal cylindrical surfaces, such as automobile cylinder wall. The boring stones are held in boring head, with the stones being held against the work with controlled light pressure. The boring is not guided externally byt instead float in the hole, being guided by the work surface. The stones are given a complex motion so as to prevent a single grit from repeating its path over the work surface. Rotation is combined with an oscillatory axial motion.

Lapping process

(1) The principle use of the lapping process is to obtain surface finish that truly smooth & flat

(2) Lapping is also used for finish round work, such as precision plug gauges, to tolerance of 0.0005 to 0.00002 in.

(3) It is a Super finishing operation

(4) It uses loose abrasive particle for finishing.

honing process.

(1) Honing process is quite simple. The most used honing machines are made for machining internal diameters.

(2) Honing tool of honing process on internal diameter is 0.060 in. to 6 inch.

(3) It is not super finishing operation but it is a finishing operation.

(4) It uses abrassive particle that are the bounded on the honing head.

Q-4) Explain 3 Different ways in which the wear in grinding wheels takes places. What can be done to prevent them.

Ans. Wear in grinding wheel can take place due to the following reason.

1. attrition wear - Attrition wear is caused by dulling of the grain of the Abrasive. It results in flat spots & rounded edges. It is similar to tool wear in a conventional cutting tool.

2. Grain fracture - occurs when the abrasive grain itself cracks. The grain fracture exposes new surfaces for cutting to take place through.

3. Bond fracture - occurs when the individual grain is pulled off from the matrix. It occurs due to excessive force on the grain, possibly due to attrition wear the grain experienced.

Prevention of wear & management.

Increasing the wheel speed has a positive effect. It reduces the cutting forces thereby reducing chance of fracture.
But it also increases the Attrition wear & causes higher temperatures to manage this suitable coolants should be used.

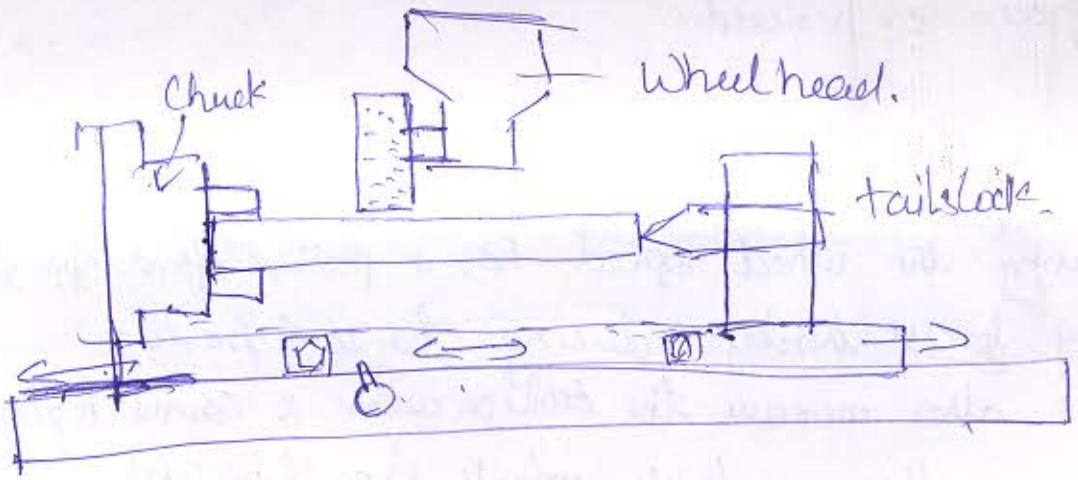
When wheel has got loaded & glazed which occurs due to clogging of cavities from chips removed & the grains also dulled the wheel can be subjected to dressing and truing operation.
Truing exposes fresh grains for cutting.

e) Differentiate between centered grinding & centerless grinding.

e. Center Type grindings (cylindrical).

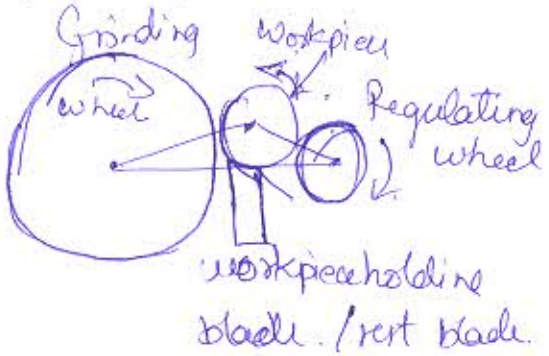
In center type grinding process the workpiece is held between dead centers. The working is similar to that of a lathe.

- The workpiece is given reciprocating motion in the transverse direction and rotational motion w.r.t. the axis of the dead centers.
- Plunge feed & traverse feed grinding are possible.
- Initial setup is easier compared to centerless grinding
- The change over from one workpiece to another takes more time hence the application for high production is limited and it can be used for batch production & piece production.



the shafts length achievable is smaller.

Centerless grinding.



As the name suggests Centerless grinding process doesn't involve holding between centres.

The workpiece is held by contact with grinding wheel, rest blade and regulating wheel.

The regulating wheel controls the speed & feed of the grinding process. The regulating wheel grips the workpiece and is coated with suitable material for gripping.

The center of the workpiece is maintained above the centers of the regulating wheel & grinding wheel.

The workpiece changeover time is very less as compared to a centered type grinding process.

Continuous feed in transverse direction is also possible with virtually no changeover time.

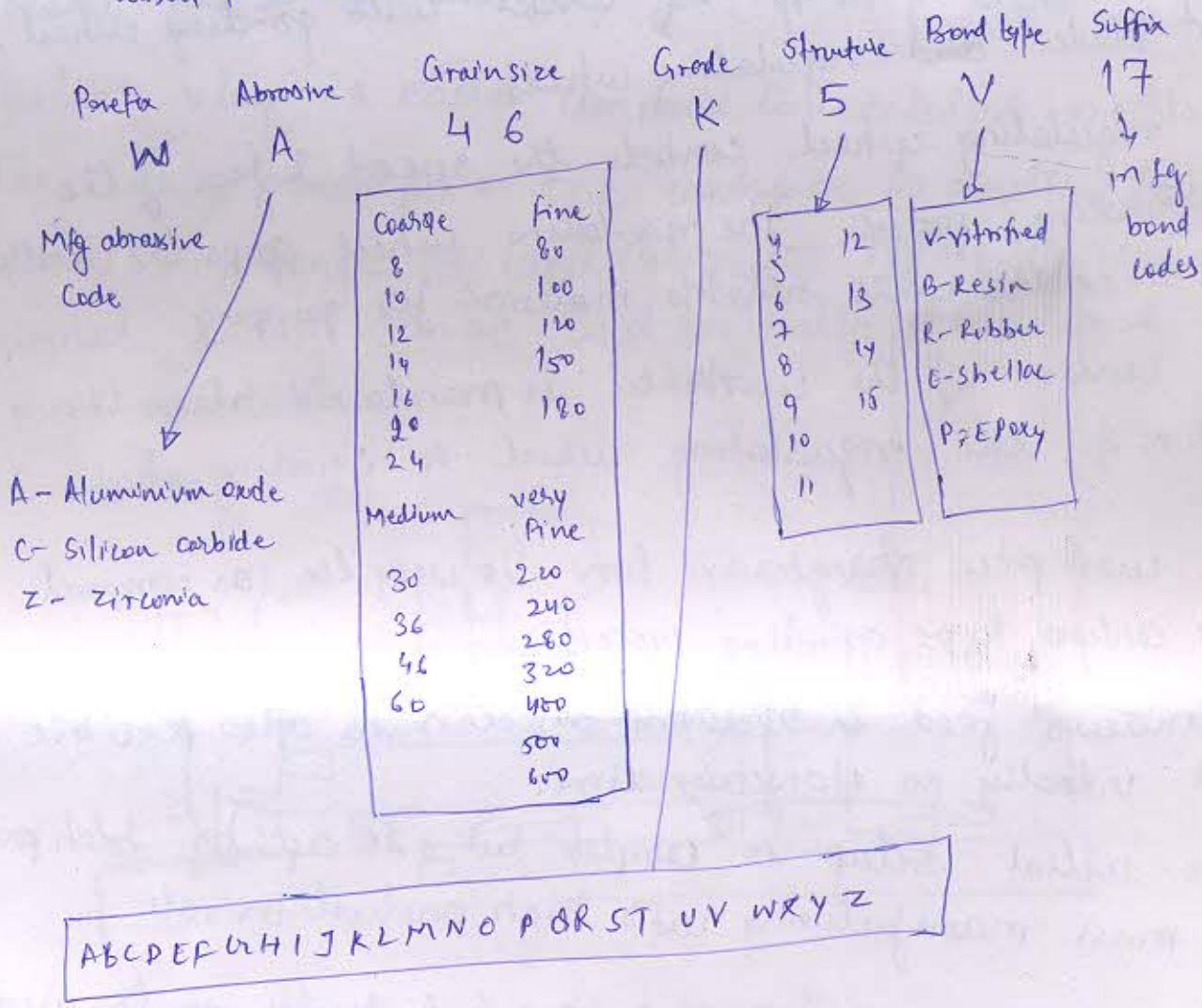
The initial setup is complex but is apt for both production & mass manufacturing with high production rate.

The stroke length is unlimited and depends on the workpiece holding fig.

Section-C

Q-a]. How are grinding wheel specified? Clearly differentiate between grade and structure of grinding wheel.?

Soln: The long codes associated with grinding to what wheels actually can be interpreted and generally have a clear meaning. Mostly all mfg will list the grit type, grit size, wheel hardness, structure and bond in every grinding wheel produced.



Grade:- The grade of the wheel is the measure of the ability to retain grit. The hardness of material to be ground also affects the choice of the wheels grade or hardness.

A harder grade can be used on soft, easily penetrated materials than on hard materials which naturally tend to dull the wheel faster. However, the softer grade wheel releases the dulled grains more readily, enabling the new, sharp grains lying under it to do the work.

Structure: Structure is basically the spacing between abrasive grains or the density of the wheel. The wheels are also given a structure number. An open structure would be 12 or higher while a close structure would be 6 or 80. Here again, the structure depends on a variety of factors not the least of which is how difficult the material is to grind. One would think that a closer spacing would make a tougher wheel but this is only true to a point. With fewer bonds holding the individual abrasive grains, the softer the wheel would be. Also the same holds true for a very open structure.

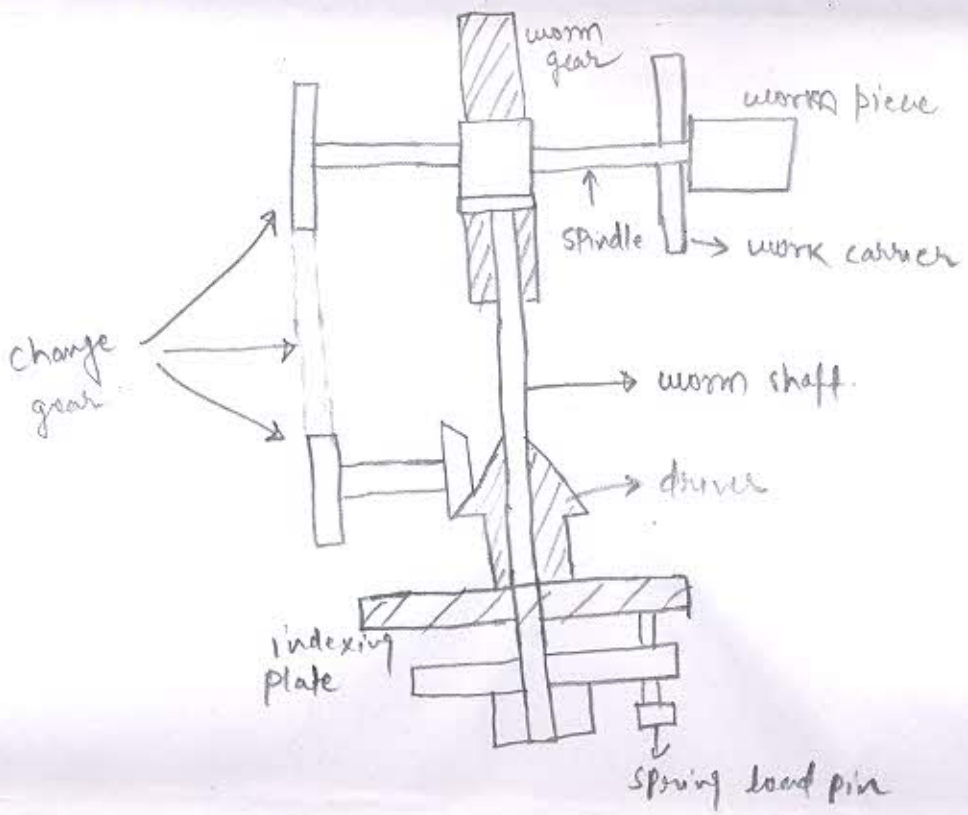
8-b) Explain the working principle of dividing head in milling machine. How would you achieve 1/13th of a revolution on the spindle on a dividing head.

Soln: Indexing is the operation of dividing the periphery of a workpiece into any number of equal parts, for example if we want to make a hexagonal bolt. Head of the bolt is given hexagonal shape. we do indexing to devide circular workpiece into six equal parts and then all the six parts are milled to an identical flat surface.

Universal deviding head

Working principle: universal deviding head can set the workpiece in vertical, horizontal, or in inclined position relative to the worktable in addition to working principle is explained below with the help of figure The worm gear has 40 teeth and the worm has Simple thread. crank is directly attached with the worm. If we revolve crank by 40 revolution the spindle attached with worm gear will revolve by only one revolution and one complete turn of the crank will revolve the spindle by 1/40th revolution. In order to turn the crank precisely a fraction of a revolution, an indexing plate is used

An indexing plate is like a circular disc having concentric rings of different number of equally spaced holes. normally indexing plate is kept stationary by a dock pin. A spring loaded pin is fixed to the crank which can be fixed into any hole of indexing plate. The turning movement of the workpiece is stably controlled by the movement of crank is explained below



On simple indexing method there is three different plates having different numbers of holes.

plate1	15	16	17	18	19	20
plate2	21	23	27	29	31	33
plate3	37	39	41	43	47	49

So we have to select plate no. 3 with 39 holes.

$$= \frac{40}{n} = \frac{40}{13} = 3\frac{1}{13} = 3\frac{3}{39}$$

we have to move 3 rotation and 3 hole on 39 hole plate.