12th std BASIC MECHANICAL ENGINEERING

LESSON 1 - LATHE

1. What is turning?

   The primary task of a lathe is to generate cylindrical workpieces. The process of machining a workpiece to the required shape and size by moving the cutting tool either parallel or perpendicular to the axis of rotation of the workpiece is known as turning.

2. What are the uses of tool room lathe?

   It is costlier than a centre lathe. This is mainly used for precision works like manufacturing tools, dies, jigs, fixtures and gauges.

3. Mention the special features of turret and capstan lathe?

   There are two way tool posts in the machine namely four way tool post and rear tool post. Four tools can be mounted on the four way post and parting tool is mounted on the rear tool post. The tailstock of an engine lathe is replaced by a hexagonal turret.

4. What is swing diameter?

   The swing diameter . (The swing diameter over bed – It refers to the largest diameter of the work that will be rotated without touching the bed). (The swing diameter over carriage – It refers to the largest diameter of the work that will revolve over the saddle).

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

   V-type bed have been found in modern machine tools. This type of V-bed gives accurate alignment to carriage and tailstock. The metal chips automatically fall through.

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

   (It is used for reducing the spindle speed, when turning on lager diameter of the work pieces and cutting coarse threads). (Eight different types of spindle speed can be obtained by this mechanism).

7. Define 'Cutting speed' in a lathe?

   The cutting speed is the distance travelled by a point on the outer surface of the work is one minute.. Cutting speed = πDN 1000 m/min (D – is the diameter of the work in mm) (N – is the r.p.m of the work).

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

   The lead screw is a long threaded shaft. It is used for moving the carriage automatically to a calculated distance only when threads have to be cut. Mostly leadscrews have an Acme thread.

9. Mention the use of a face-plate.

   Face plate is used to hold large, heavy and irregular shaped workpieces which cannot be conveniently held between centres. It is circular disc bored out and threaded to fit to the nose of the lathe spindle. It is provided with radial plain and 'T' – slots for holding the work by bolts and clamps.

10. Mention the formula to use the cutting of a thread, in a lathe?

TPI on leadscrew by TPI on work = driver teeth by driven teeth.

LESSON 2 – DRILLING MACHINE

1. Define – "Drilling"?

Drilling is the operation of producing a cylindrical hole of required diameter and depth by removing metal by the rotating the cutting edges of a drill bit.

2. Mention any four types of drilling machine?
   - Portable drilling machine
   - Radial drilling machine
   - Gang drilling machine
   - Multi spindle drilling machine
   - Bench drilling machine
   - Up right drilling machine
3. What are the different types of drills?
   - Flat drill
   - Straight fluted drill
   - Twist drill
   - Centre drill.
4. What are the uses of "Flute" in a drill?
   - Flutes form the cutting edges on the point.
   - To allow the chips to escape
   - To cause the chips to curl
   - To permit the collent to reach the cutting edges.
5. Mention any four types of tool – holding devices in drilling machine
   - Directly fitted in spindle
   - A sleeve
   - A socket
   - A drill chuck
   - Special attachment
   - Tapping attachment
   - Floating holder.

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

Reaming: The size of hole made by drilling may not be accurate and the internal surface may not smooth. 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: Boring is the operation enlarging the diameter of the hole previously made.

7. In which situation boring is needed?

To enlarge a hole by means of an adjustable cutting tool. This is done when a suitable sized drill is not available (or) the hole diameter is so large that is cannot be ordinarily drilled.

8. What is the need of spot facing?

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

9. Define "Cutting speed" of a drilling machine.
   - Cutting speed (c.s) $V = \pi dn/ 1000$ m/min
   - 'd' is the diameter of the drill in mm,

- 'n' is the speed of the spindle in RPM
- π =22/7 (or) 3

LESSON 3 – SHAPING MACHINE

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.
   - Tool head
   - Clapper box
   - Ram
   - Table
   - Base
   - Table support.

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

   Crank and slotted link mechanism of a crank type shaper converts the rotation of an electric motor into reciprocating movement of the ram.

4. Define "cutting speed" of shaping machine.

   The distance an object travels in a particular period of time is known as speed. 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. In a shaper, the cutting speed is considered only during the forward cutting stroke. This is expressed in metre per 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 double 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. It is expressed in mm or in inches.

7. What is the use of a clapper box?

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

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

   As the vertical slide is mounted on the swivel base of the toolhead, it may be set and moved at any desired angle to machine angular surfaces like 'V' grooves and dove tail grooves.

LESSON 4 – GRINDING MACHINE

1. What is meant by grinding?
   - Grinding is a metal cutting operation where metal is cut by a rotating abrasive wheel. This machine on which grinding the operation is performed is called a grinding machine
   - The accuracy of grinding process is 0.000025 mm.
2. Name any four types of grinding machines
   - Hand grinding machine
   - Bench grinding machine
   - Floor stand grinding machine
   - Flexible shaft grinding machine
   - Swing frame grinding machine
   - Abrasive belt grinding machine.
3. What is meant by centreless grinding?

   Centreless grinding is a method of grinding external, cylindrical, tapered and formed surfaces on workpieces, the workpiece is not held between the centres or in chucks. It is placed in a floating condition between two grinding wheels. There are two types of centreless grinding and they

   - External centreless grinding
   - Internal centreless grinding,
4. What are the four types of surface grinders?
   - Horizontal spindle and reciprocating table type
   - Horizontal spindle and rotary table type
   - Vertical spindle and reciprocating table type
   - Vertical spindle and rotary table type.
5. List out any four operations performed in a grinding machine?
   - Cylindrical grinding
   - Taper grinding
   - Gear grinding
   - Thread grinding.
6. What are the effects of dry grinding?

   Dry grinding is the method of doing grinding operation without applying coolant. Dry grinding produces undesirable effects on work surface. It leads to burring and discoloration of work surfaces. The cutting edges of the grinding wheel lose their cutting capacity. So, dry grinding should better be avoided.
7. Mention any four types of bonds used in grinding wheel.
   - Vitrified
   - Silicate
   - Shellac
   - Resinoid
   - Rubber
   - Oxychloride
8. What is meant by “glazing”?

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

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

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

10. What are the reasons for chattering?

Sometimes the way pattern of criss cross lines are visible on the ground surface. This condition is known as chattering. It takes place when the spindle bearings are not fitted correctly and because of the imbalance of the grinding wheel.