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EDWIN ASSINGNMENT FILE



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WORKSHOP Tutorial

Sheet

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Subject :- Mechanical Workshop and Engineering.

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Dep :- B TECH - CSE - I

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Properties and testing of Metals

7. What do you understand by Hooke's law?
Provide suitable examples of hooke's law.

Ans: Hooke's law states that the amount of force needed to compress or extend an elastic object is proportional to the distance compressed or extended.

$$F = -kx$$

For example -

- (i) Spring Scale
- (ii) Balance wheel of clock
- (iii) Manometer
- (iv) Recoil of a Toy gun.

2. Define Stress and Strain also indicates their mathematical expression.

Ans: Stress - It is a type of resisting force that acts on a body per unit area. When this resisting force is exerted by the body to avoid deformation, is known as stress.

$$\text{Stress} = \frac{\text{Resisting Force}}{\text{Area}}$$

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Strain - It is the ratio of the amount of deformation experienced by the body in the direction of force applied to the initial sizes of the body.

$$\text{Strain} = \frac{\Delta x}{x} \quad \text{where, } \Delta x = \text{Change or deformation}$$

$x = \text{original form.}$

3. Establish a relationship between Stress and Strain for a ductile material.

Ans: (i) O to A :- Proportional limit

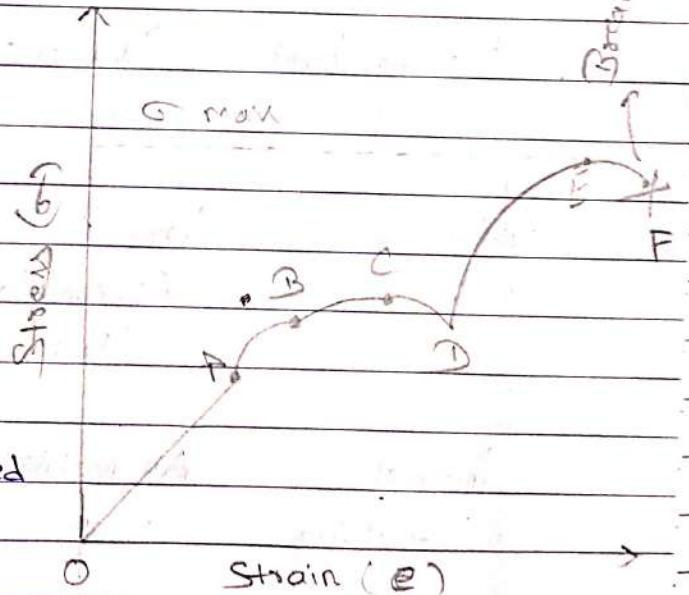
$\therefore \text{Stress} \propto \text{Strain}$

$$\sigma \propto e$$

$$\therefore \sigma = Ee$$

Where,

$E = \text{Young's Modulus}$



(ii) A to B :- Elastic limit

(iii) B to C :- Point C is called 'upper yield point'

(iv) C to D :- Point D is called

'lower yield point.'

Strain is more at point D than C

(v) D to E :- Point E is called 'Yield point'. Stress is maximum at the yield point.

(vi) E to F :- Stress decreases but strain increases.

At point F, the material breaks.

Hence, it is called as 'Breaking point'.

4. Discuss Various properties of metals with Suitable diagram and examples.

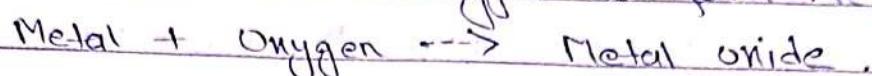
Ans :- Physical Properties of Metals.

Property	Statement	Application
Melting point	Solid at room temp. Hg used in thermometers.	
density	Vary from less than water (Sodium) to very dense (lead)	Al used in aircraft because of low density.
Thermal Conductivity	All metals conduct heat well	Al and stainless steel used in cooking pans.
Malleability	Metals can be converted into thin sheets.	Car bodies made of flat steel sheets.
Ductility	Metals can be converted into long wires.	Gold, Silver or Copper used to make wires.

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Chemical properties of Metals

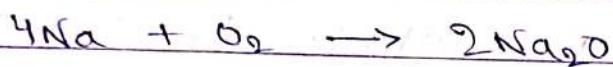
1. Metals react with oxygen to form metal oxide.



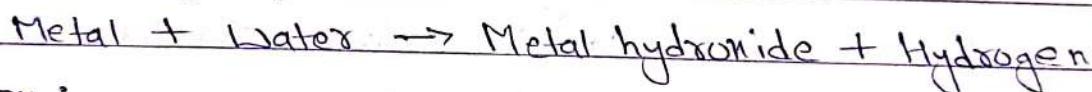
(Basic)

for ex:

Sodium Metal reacts with oxygen at room temperature and forms Sodium oxide.

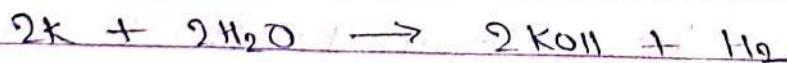


2. Metals react with water to form metal hydroxide and hydrogen.



for ex:

Potassium and Sodium violently react with cold water and form potassium hydroxide and sodium hydroxide, respectively with the release of hydrogen gas.



3. Metals react with acid to form salt and hydrogen.



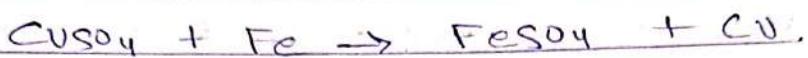
for ex:

Sodium reacts with dil. hydrochloric acid to form sodium chloride and hydrogen gas.



4. When a more reactive metal is put in a salt solution of a less reactive metal, the more reactive metal displaces the less reactive metal from its salt solution.

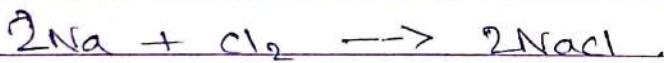
for ex.



5. Metals react with chlorine to form ionic chlorides

for ex.

Sodium metal readily reacts with chlorine and forms ionic chloride called Sodium chloride.



5. Define the following and differentiate.

(i) Impact Strength : It can be defined as the resistance of the material to fracture under impact loading i.e under quickly applied dynamic loads.

(ii) Fatigue : The material fails at a much lower stress than the one required for its failure through fracture under a single application of steady loads. The whole phenomenon of material failure is known as fatigue.

(iii) Resilience : The amount of energy that a unit volume of material can absorb within the elastic range is known as Resilience.

(iv) Malleability : The process by which a material can be hammered into thin sheets without breaking, is termed as malleability.

(v) Ductility : The process by which a material can be drawn into a long thin line, is termed as Ductility.

Materials Used in Woodworking.

1. What do you understand by hard wood and soft woods. Differentiate between hard and soft wood.

Ans: Hardwood :- The wood that derive from angiosperm trees; mostly deciduous trees, these have broad leaves that fall every autumn. Ex-> Oak, Teak and Mahogany.

Softwood :- The wood that derive from gymnosperm trees, like Conifers. Ex-> Pine, Spruce and Fir.

Differentiate between Hard and Soft Wood

Hard Wood

Soft Wood

(i) originates from deciduous trees originates from evergreen trees

(ii) It is more expensive. It is less costly

(iii) It is hard in density
(not always) It is soft in density
(Not always)

(iv) Its grain is close Its grain is loose

(v) Good fire resistance Poor fire resistance

(vi) Heavy weight Light weight

(vii) Generally Dark in Colour Almost light in Colour.

2. Discuss the advantage of using timber.

Ans :

Following are the advantages of using timber :-

- (i) It can be used for building support equipment or products
- (ii) It is cheap and easily available.
- (iii) It can be used for make decorative items for home and Commercial purpose.
- (iv) It is light in weight as compared to metal.
- (v) It can be transformed easily from one place to another.
- (vi) It can be used as medicinal purpose.

3. Differentiate between deciduous and Evergreen trees. also provide suitable examples for both of them.

Ans :

Deciduous Trees

- Hardwoods
- Has broad leaves that change colour in the fall
- loses leaves in the winter to conserve energy.
- Needs rich soil to grow
- lots of sunlight reaches the ground.

Evergreen Trees

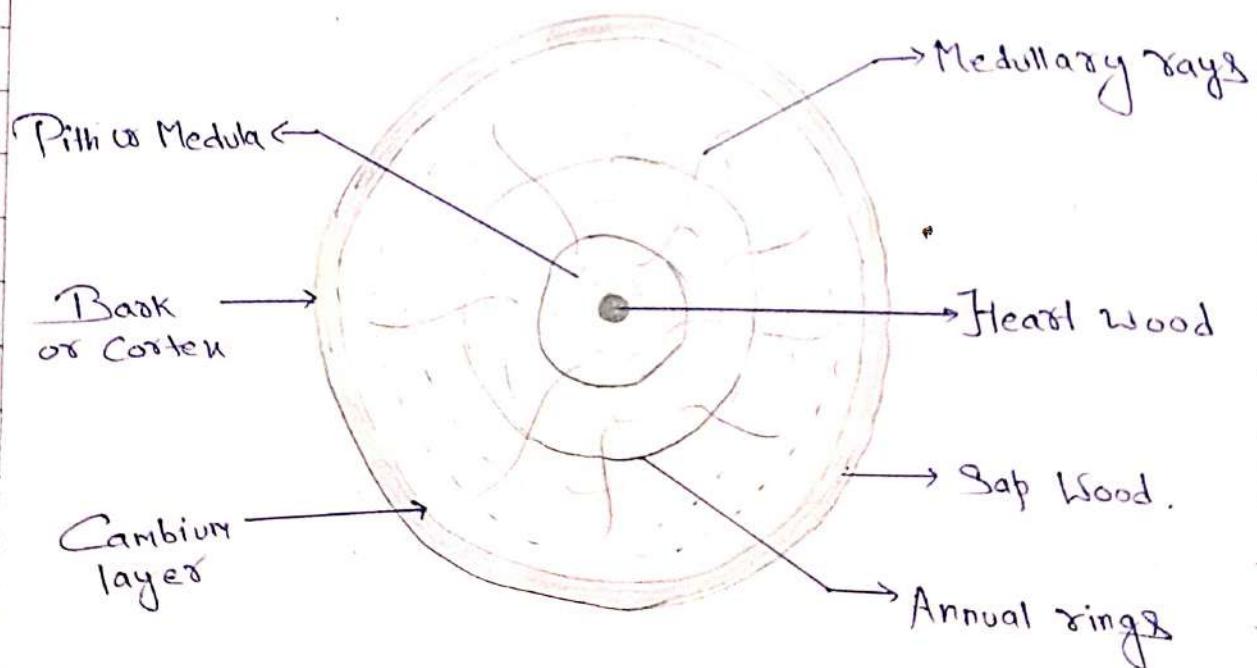
- Softwoods
- Stays green all years
- Has needles and cones
- Can grow in poor soil
- Little sunlight reaches the ground.

- Can be tall or short Usually tall
- Produces flowers and Doesn't produce flowers
fruits or fruit
- Generally round shaped Generally Cone shaped.
- Ex: Maple, birch, ash Ex: fir, cedar,
 white pine.

4. Discuss and in detail with neat diagram the structure of timber.

Ans:

Structure of Timber



(i) Pith or Medulla : The innermost Central portion that Contains entire Cellular tissue.

(ii) Heart wood : The annual rings that Surround the pith. this portion is dark in Colour and it does not take part in the growth of tree.

(iii) Sap wood : The few outer annual rings are called Sap wood. this portion of the tree is active in growth.

(iv) Cambium layer : The thin layer between the bark and Sapwood is termed as Cambium layer.

(v) Medullary Rays : These are Vertical layers of cellular tissue and are thin Radical lines from pith to the Cambium layer. They keep the annual rings tightly gripped together.

(vi) Bark or Cortex : It is the outermost Cover or Skin of the tree. It is protective layer of the tree.

(vii) Annual rings : The layer of wood produced by a year's growth of a woody plant.

5. Differentiate between exogenous and endogenous trees.

Ans: The difference between exogenous and endogenous trees are :-

Exogenous trees grow in outward (\rightarrow) direction. It grows in width by forming a new layer of wood under the bark.

While, endogenous trees grow in inward (\leftarrow) direction. It grows by forming new fibres within the trunk interdispersed with the old fibres.

Examples of exogenous tree are Mango, Shisham, Pipal, Neem etc.

While, Examples of endogenous tree are pine tree and so on. etc.

6. What do you understand by the term seasoning, provide necessary examples in support of your answer.

Ans: Seasoning of timber is the process by which moisture content in the timber is reduced to required level. By reducing moisture content, the strength, elasticity and durability properties are developed. A well-seasoned timber has 15% moisture content in it.

For example -

Removal of wood sap immersing logs into water flow, exposing the woods to air for seasoning, etc.

7. Explain in details and with diagram the process of seasoning.

Ans: There are two methods of seasoning of timber which are as follows

- (1) Natural Seasoning
- (2) Artificial Seasoning.

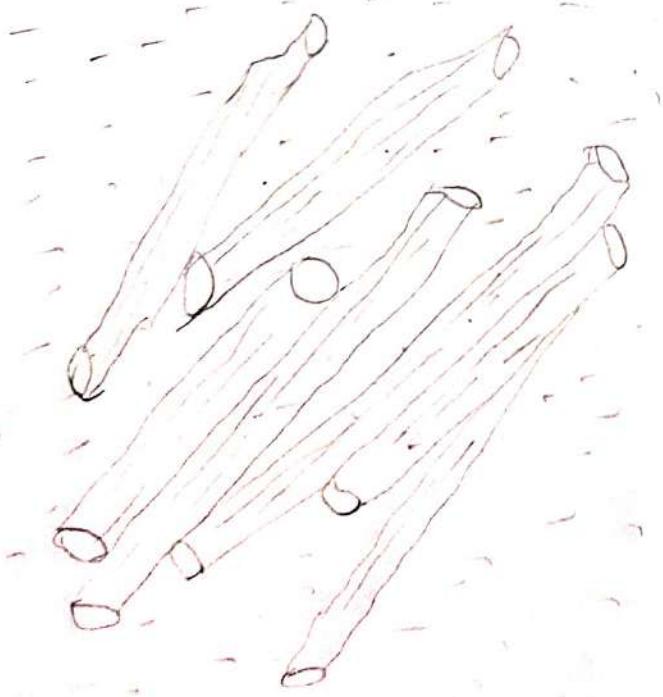
Natural Seasoning :- Natural seasoning is the process in which timber is seasoned by subjecting it to the natural elements such as air or water.

(a) Water Seasoning - It is the process in which timber is immersed in water slab which helps to remove the sap present in the timber. It will take 2 to 4 weeks.

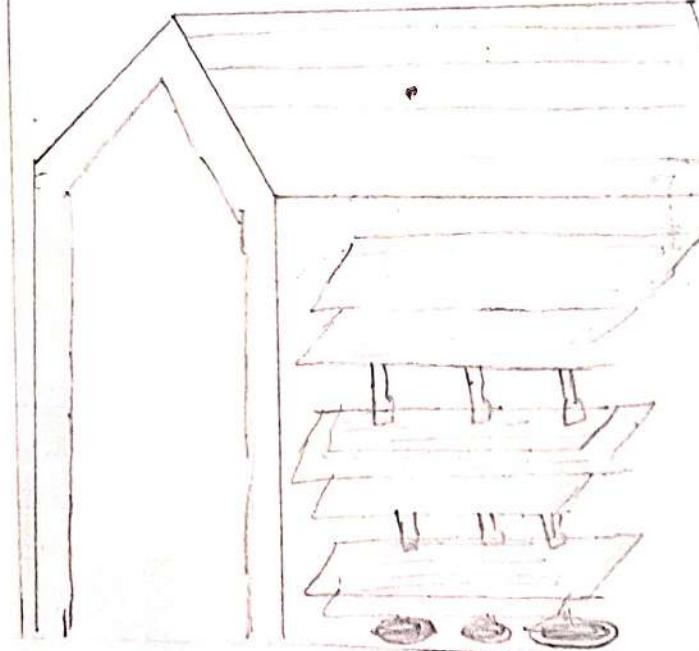
of time and after that the timber is allowed to dry. Wet seasoned timber is ready to use.

(b) Air Seasoning — In the process of air seasoning timber logs are arranged in layers in a shed. The arrangement is done by maintaining some gap with the ground so platform is built on ground at 300 mm height from ground. The logs are arranged in such a way that air is circulated freely between logs.

Water Seasoning



Air Seasoning



Artificial Seasoning :- Artificial seasoning of timber is developed now a days.

By artificial seasoning, timber is seasoned within 4-5 days.

(a) Seasoning by Boiling :-

Seasoning of timber is also achieved by boiling it in water for 3 to 4 hrs.

After boiling timber is allowed to dry for long.

Quantity of timber boiling is difficult so, sometimes

hot steam is passed through timber logs in enclosed

room.

(b) Chemical Seasoning —

In this process, timber is

stored in suitable salt

solution for some time. The

salt solution used has the

tendency to absorb water from the timber.

So, the moisture Content is removed and then timber is allowed to drying. It affects the strength of the timber.

(C) Kiln Seasoning -

In this method timber is subjected to hot air tight chamber. The hot air circulates in between the timber logs.

It reduces the moisture Content. The temperature inside the chamber is raised with the help of heating Coils.

When the required temperature is obtained moisture Content and relative humidity gets reduce and timber get seasoned. Even though it is costly process. It will give good results strength wise.

(d) Electrical Seasoning -

In this method of electrical seasoning timber is subjected to high frequency alternating Currents.

The resistance of timber against electricity is

measured at every interval of time. When the required resistance is reached seasoning process is stopped because resistance of timber increases by reducing moisture content in it. It is also called as rapid seasoning as it is uneconomical.

8. What are the defects that occur in timber. briefly Explain the types of defects with neat and suitable diagram .

Ans: Following are the defects in timber :-

- (i) Defects due to natural forces.
- (ii) Defects due to attack by insects
- (iii) Defects due to fungi
- (iv) Defects due to defective seasoning.
- (v) Defects due to defective conversion.

Defects in Timber due to Natural Forces



(a) Knots : It occurs when branches of a tree grows into the trunk.

(i) Dead Knots - The remains of damaged branches after drying out they become loose and fall out.

(ii) Live Knots - They are sound and firm. If small, are not great of a defect.

(b) Shakes : This defect occurs when there is informal stresses within the timber and it causes cracks along its direction.

(i) Ring Shake

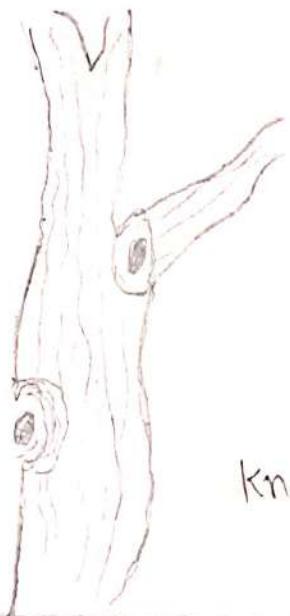
(ii) Heart Shake

(iii) Star Shake.

(c) Kind Snail : This occurs when a branch of a tree is cut off improperly, causing abnormal bark growth in the area where it was cut off.

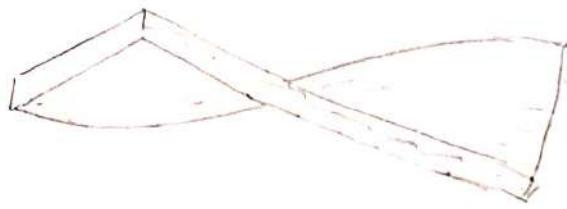
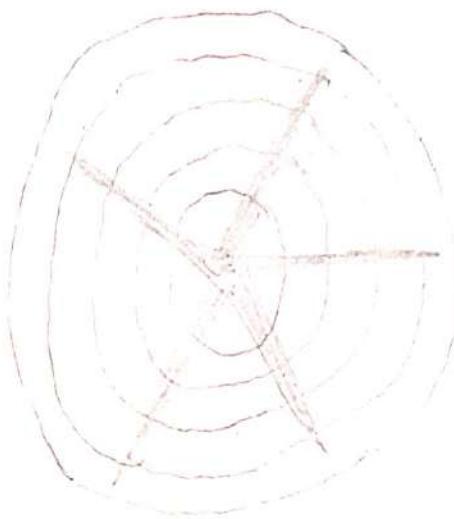
(d) Twisted fibres : It occurs due to the fibres of the timber twisting around each other.

(e) Upsets : This is also caused by the fast blowing wind. It affects the fibres of the tree.



Knots

Shakes



twisted fibers



Upsets

Defects due to attack by insects

- Beetles are small insects that make holes in almost all the Sapswoods.
- Termites live in a Colony. They are very fast in eating Woods & making tunnels through it.
- Marine borers are found in Salt water. Usually they make tunnels in wood to take refuge or shelter.

Defects due to fungi

(a) Stain : When fungi feed only on Sapwood, where the food materials are stored, it causes a stain.

(b) Decay : Food eating or wood destroying fungus is responsible for this type of defect in wood.

Defects due to defective seasoning

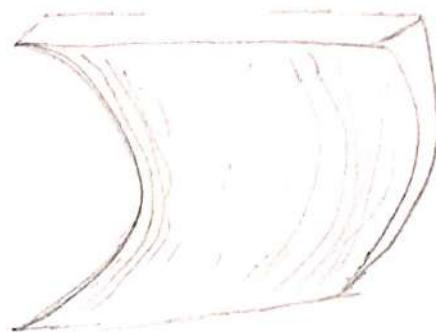
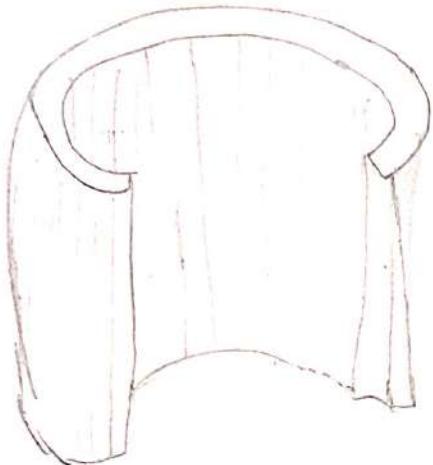
(a) Bow : Curvature formed in direction of the length of the timber is called bow.

(b) Cup : Curvature formed in the transverse direction of the timber.

(c) Check : a Crack that separates fibres.

(d) Split : a Special type of check that extends from one end to another.

(e) Honey Combing : Stress is developed in the headwood during the drying process or seasoning.



Bow



CHECKS

Defects due to defective Conversion

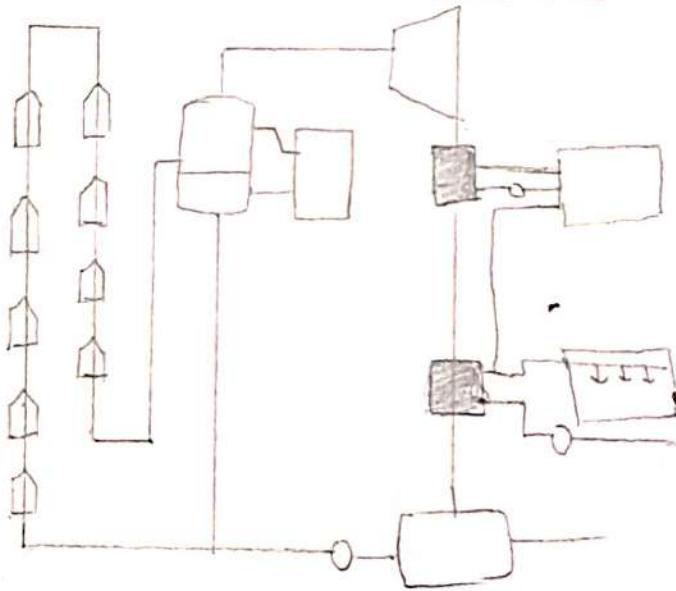
- (a) Boxed Heart : This term is applied to the timber, which is sawn in a way that the pith or the center heart falls entirely within the surface throughout its length.
- (b) Machine Burnt : Overheating is the main reason.
- (c) Machine Notches : defective holding and pulling.
- (d) Mis-cut : erroneous cutting or sawing of wood
- (e) Imperfect Grain : Mismatch in grain alignment.

Plant layout

1. What do you understand by the term layout.
Provide suitable diagram and example of layouts.

Ans:

Layout refers to the way in which we organise the materials which makes up the content of a design. The aim of layout is both to present information in a logical coherent ways & to make the important elements stand out.



for ex - Plant layout, fixed layout,
Position layout etc ..

2. Differentiate between plant layout, fixed position layout, all diagram have to be drawn with respect to the different types of layout ?.

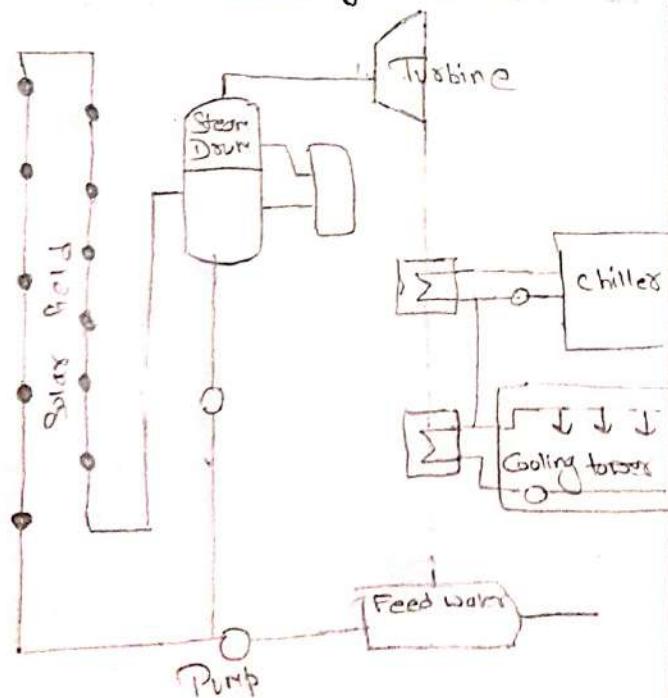
Ans: Plant layout is the arrangement of machines, work areas & service areas with a factory.

Plant layout involves the development of physical relationship among building, equipment & production operations.

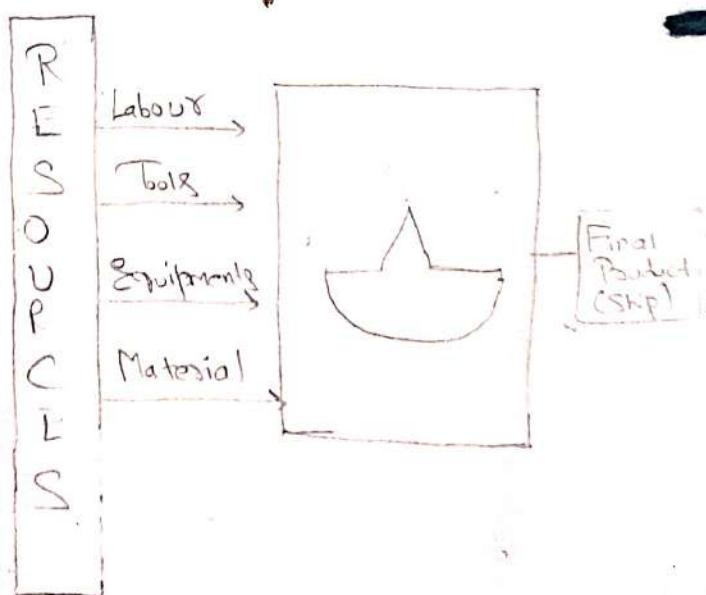
Whereas In fixed position layout, the project remains in one place, & workers & equipments come to that one work area.

for ex → a ship, a highway, a bridge, a house & an operating table in a hospital operating room.

Plant Layout



Position layout -



3. Why it is important for a plant or for a company to work according to layouts, give necessary examples & elaborate the answers accordingly.

Ans: It is important for a plant or for a Company to work according to layout because of following reason :-

- (i) Increases efficiency - A good plant layout will help to increase efficiency by optimizing workflow and reducing material flow.
- (ii) Enhances productivity - With few obstructions & less wastage, better communication and a more streamlined flow of the production process, a well organized plant layout can result higher productivity.
- (iii) Reduces wastage - Poor layout can cause wastage of resources due to inefficient and ineffective production line.
- (iv) Minimizes Risk & Accidents - Improved Safety can be achieved in the workplace by minimizing obstructions & unnecessary equipment.
- (v) Develops economy of scale - It can help to increase profits by reducing production costs.

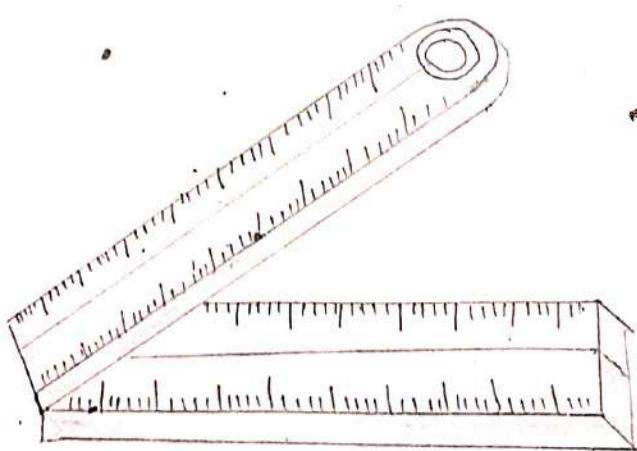
Types of Tools

1. Classify different types of tools in the manner in which they are use with proper and neat diagram.

Ans: The different types of tools are as follows :-

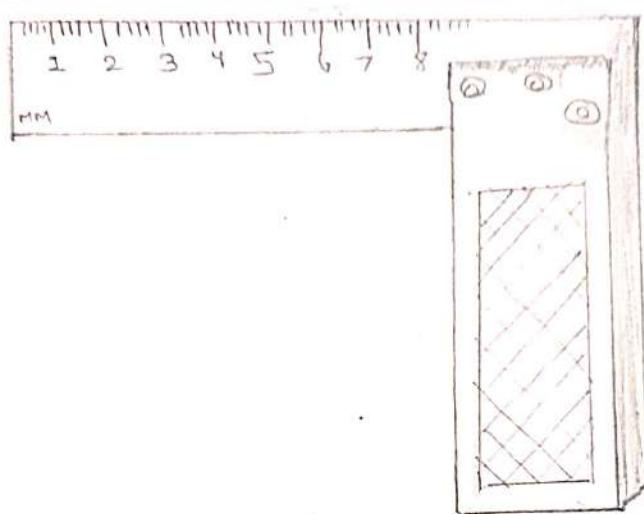
(i) Marking and Measuring tools

- (a) Folding Rule - It is mainly used for measuring & setting out dimensions.



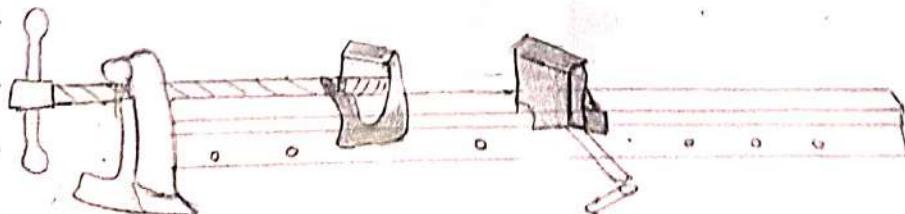
- (b) Try Square - It is used for measuring and

Setting out dimensions, testing the finish of a planed surface, draw parallel lines at right angles to a plane surface.

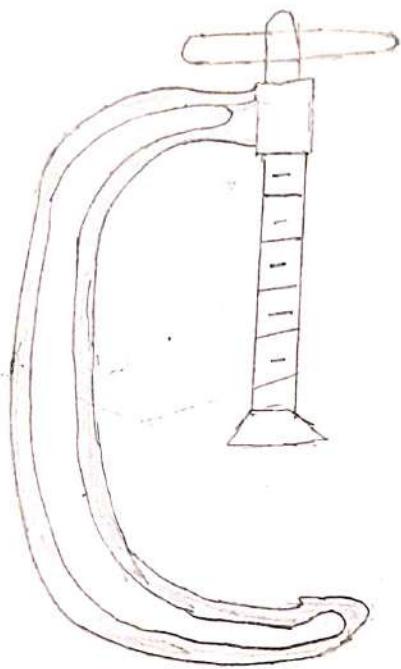


(ii) Holding and Supporting tools

(a) Bar Clamp - Used for the Clamping of large section work pieces for joint gluing & general applications.



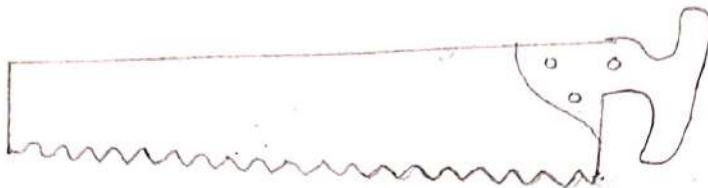
(b) C-clamp - Used by Carpenters for holding and supporting wood pieces in position for carrying out different operations.



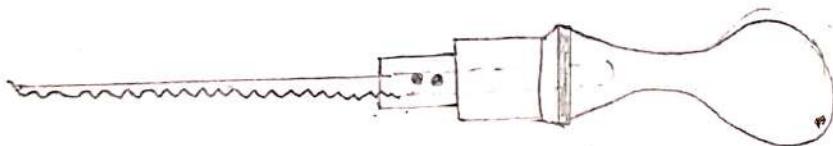
(iii) Cutting tools

(a) Compass Saw - It can be used easily for taking straight or curved cuts on outside or inside of the wood.

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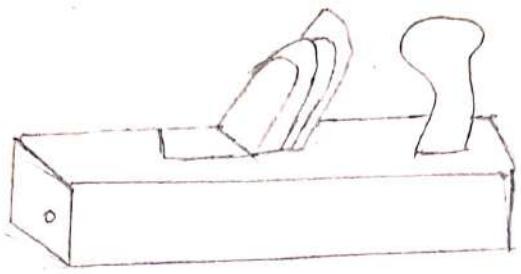


(b) Key hole Saw - ~~the~~ Commonly used to Create electrical box Cut outs in drywall & to cut free form holes in a Variety of building material.

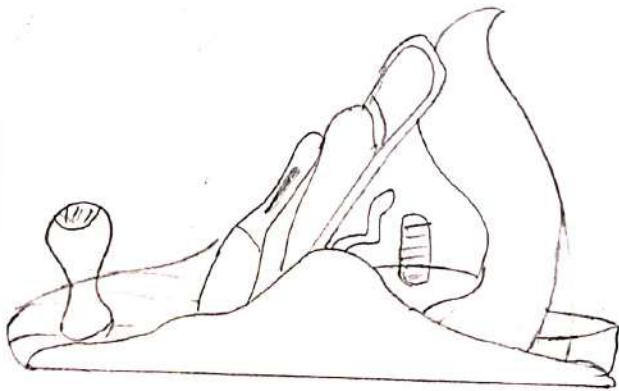


(iv) Planing or paring tools:

(a) Wooden jack plane - Used for dressing timber down to size in preparation for dressing timber down to size in preparation for jointing and/or edge jointing.



(b) Iron jack plane — it is used for the same purpose as a wooden jack plane, but it gives a better finish than the latter.

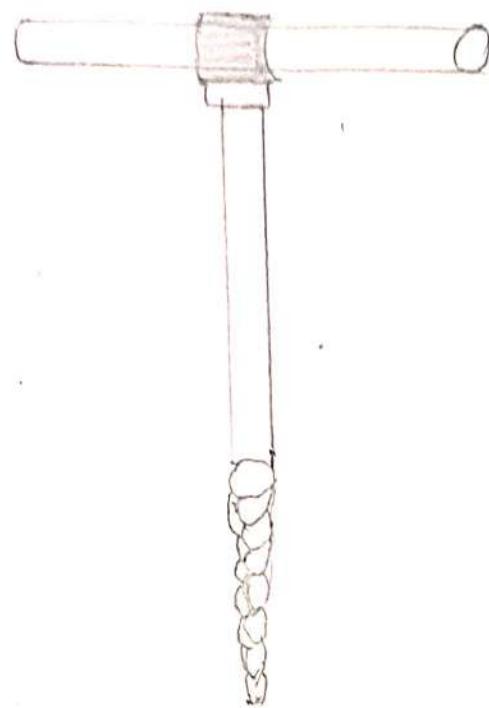


(v) Boxcutting tools

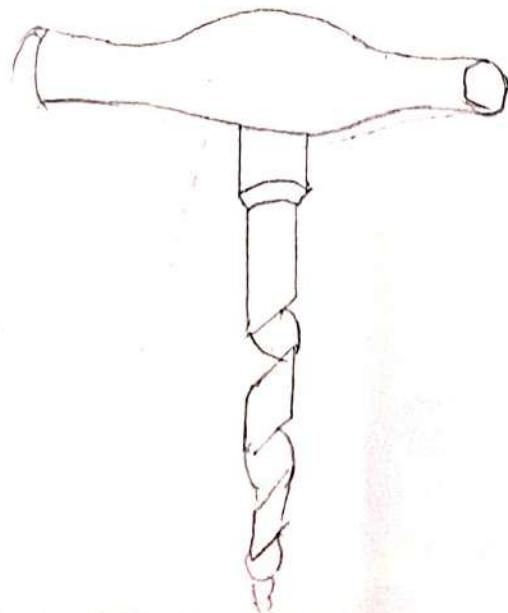
(a) Auger — used to drill holes into the

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ground and other surfaces of materials.

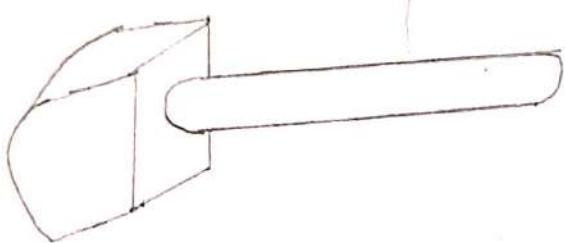


(b) Gimlet - Used for drilling small holes, mainly in wood, without splitting.



(vi) Striking tools

(a) A Mallet — It is used for striking the cutting tools, which have a wooden handle.



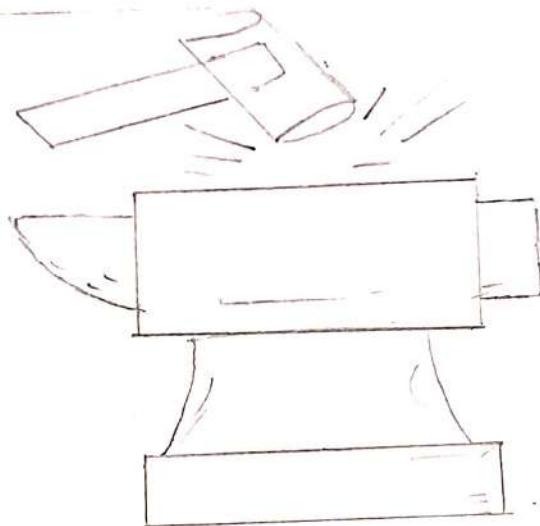
(b) A claw hammer — used to drive the nails into the wood & claw is used for extracting nails out of the wood.



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Q. What do you understand by the term anvil.
Provide suitable diagram & its advantages.

Ans:



It is a iron block on which metal is placed to be shaped, originally by hand with a hammer : with a smooth working surface of hardened . A projecting Conical break, or horn , at one end is used for hammering curved pieces of metal . Its weight is of 50 kg

Advantages -

- (i) It is hard & its weighs a lot so it resists moving and assist the Smith by providing hammer rebound for her or him .
- (ii) Used forounding your piece
- (iii) used for cutting or bending .

3. Define Chisel. What are the advantages of using chisel & also state its classification.

Ans: A chisel is a tool with a characteristically shaped cutting edge (such that wood chisel have tent part of their name to a particular grind) of blade on its end, for carving or cutting a hard material such as wood, stone, or metal by hand, struck with a mallet or mechanical power.

Advantages —

Chisels have two main purposes — breaking up materials & removing shavings from a material. Chisels are used for cutting concrete, for opening up holes & carving & finishing pieces.

Classification —

- (i) Firmer chisel
- (ii) Dovetail chisel
- (iii) Mortise chisel
- (iv) Socket chisel
- (v) Gouge chisel

4. Differentiate between drilling tools and Measuring tools . also provide Suitable examples .

Ans :- The difference between drilling tools & Measuring tools are as follows :-

Drilling tools is used for making a Circular hole in the workpiece .

While , measuring tools is used for marking , measuring , setting out angles and parallel lines and testing .

Examples of Drilling tools are Hand drill , Standard electric drill , twist bits , Dovet bits etc.

While , Examples of Measuring tools are folding rule , A Steel rule , A folding tape A Try square , a wooden straight edge , Bevel square etc .

5. Differentiate between Planing tools and Cutting tools . also provide Suitable examples for the same .

Ans :- The difference between planing tools & Cutting tools are :-

Planing tools includes various type of planes, spoke shaves & draw knives etc.

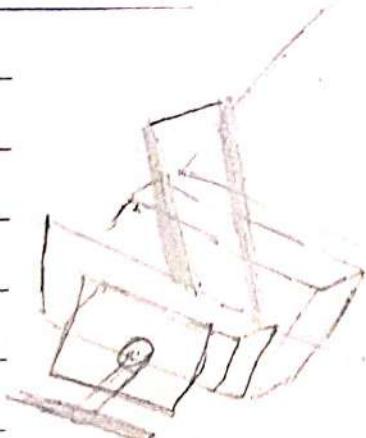
While, Cutting tool is typically a hardened metal tool that is used to cut, shape, & remove material from a workpiece by means of machining tools.

Examples of planing tools are wooden jack plane, Iron jack plane, Trying plane etc.

While, Examples of cutting tools are saws, chisels, adze & axe etc.

6. Discuss the uses of a Carpenter Vise with a neat labelled diagram.

Ans:



Carpenter Vise is Very important tool used in Carpentry Shops and is used for holding wooden jobs.

A Carpenter Vise is a type of Vise primarily designed to hold clamp wood without damaging the surfaces. Wood often needs to be clamped when completing tasks like sawing, drilling or Carpentry.

7. Discuss the type of tools that are used for sheet metals purposes. State the advantages & disadvantages of these tools.

Ans: Following are the tools that are used for sheet metals purpose :-

(i) Angle Grinder - used to Cut, Sharpen, Sand, grind & Cut different types of metals.

(ii) Throatless Shear - Use to make straight, curved, and irregular cuts on sheet metals.

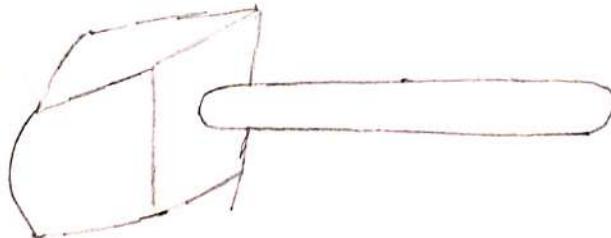
(iii) Corner notcher - used on different types of sheet metals. It is powered hydraulically.

(iv) Pounding hammer - used as sheet metal tools to flatten, bend shapes, straightens & smoothen sheet surfaces.

- (v) Flange and punch tool — the punching tools are used on sheet metals to create holes around the material edges.
- (vi) Shrinker & stretcher — it is primarily used to form curves on sheet metals.
- (vii) Cleco fasteners — used to hold sheet metals & other parts like frames or stiffeners together.

8. Explain with diagrams the following tools

(i) Mallet —



It is made of hard wood & is rectangular on round in shape, provided with a wooden handle. It is used for striking the cutting tools.

(ii) Ball-peen hammer —



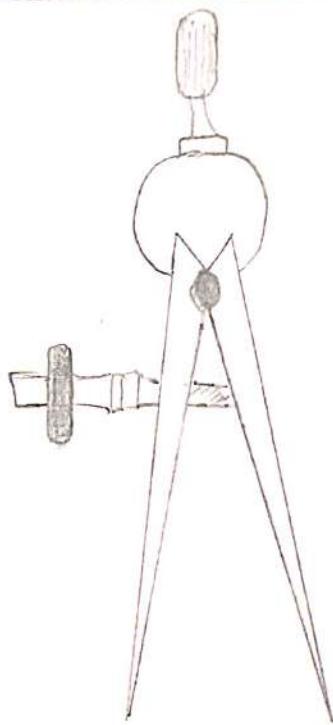
A ball peen hammer also known as machinist's hammer, is a type of peening hammer used in metal wood working. It has two heads, one flat and the other, called the peen rounded.

(iii) Cross peen hammer —



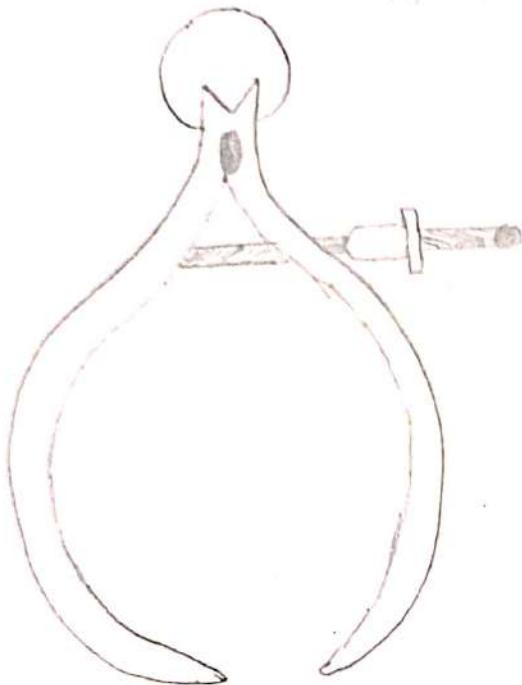
Cross peen hammers are used where no space is a little restricted, such as working in a corner. Another possible use, is when a nail is held in the hand between fingers.

(iv) Dividers —



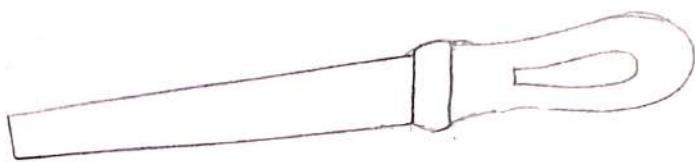
Dividers are very useful instruments employed in marking work. They are similar in construction to the calipers but their legs are not bent. Also the free ends of the two legs are sharp points. Used for measuring distance b/w two point of parallel lines on a flat surface.

(v) Calipers -



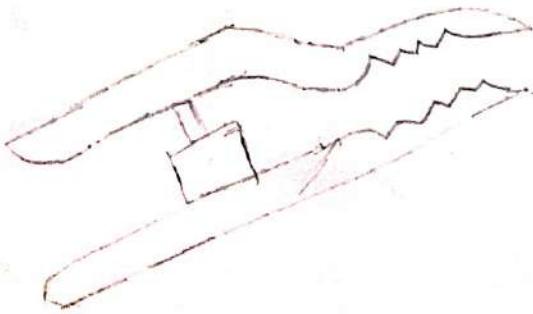
Calipers are the devices used for measuring and transferring the inside or outside dimensions of Components. They consist of two bent legs connected together at one end by means of friction joint. Both the legs are similar in construction & dimensions having a common friction joint at one end and the other end remains free.

(vi) Flat file -



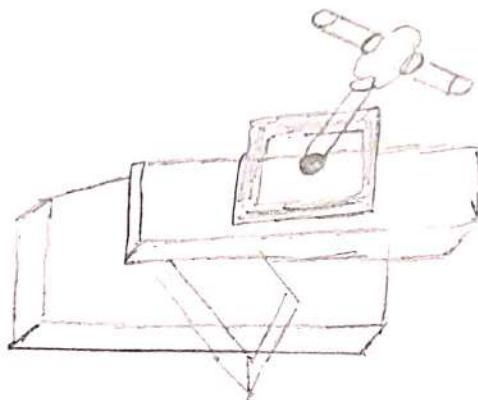
This file is of rectangular Cross Section in Shape. It is made Slightly tapered both in width and thickness. Double Cut teeth are Cut on the face & Simple Cut teeth are cut on the edge. These are used to reduce flat Surface by filing of finishing.

(vii) Electrode holder -



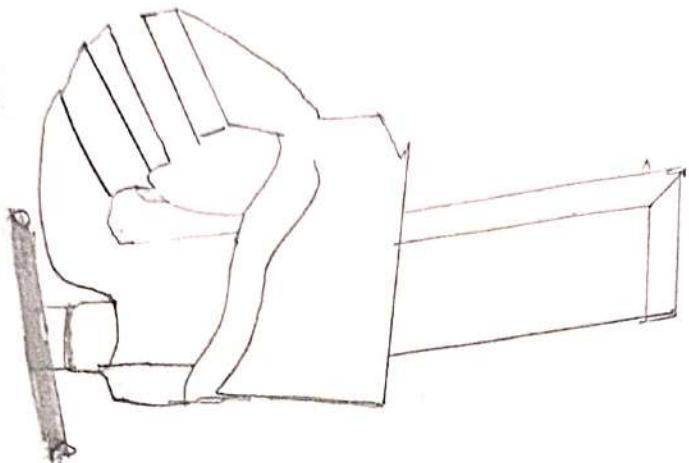
Electrode holder is the insulated handle that clamps onto the electrode. The welder holds this device during welding to control the arc.

(viii) Carpenter Vise -



Carpenter Vise is very important tool used in Carpentry Shops and is used for holding wooden jobs. A Carpenter Vise is a type of Vise primarily designed to hold Clamp wood without damaging the surfaces.

(ix) Bench vice —



A bench vice is designed to be placed on top of a table or bench. It is used to hold an object safely & securely so that it can be worked on. make work such as Sanding, finishing, chipping, sawing etc.

9. What do you understand by the lathe machine.
State the advantages of using lathe machine.

Ans: A lathe is a machine tool that rotates a workpiece about an axis of rotation to perform various operations such as cutting, sanding, knurling, drilling, deformation, facing and turning, with tools that are.

applied to the workpiece to create an object with symmetry about that axis.

Some of the advantages of Using lathe machine are :-

- (i) High productivity - Produce high quality products with top notch accuracy.
- (ii) High Speed - Produce many products in a lesser time
- (iii) Saves time & Money - Saves a lot of time, it also saves money because there is no need to have many operations or turners.

10. Discuss the different parts of lathe machine.

Ans: The different parts of lathe machine are :-

- (i) Headstock - The headstock is usually located on the left side of the lathe and is equipped with gears, Spindles, Chuck, gear speed control levers & feed controllers. Using a chuck, it rotates the work.
- (ii) Tailstock - It is also sometimes called a tool headstock or a puppet head. Usually located on the

right side of the lathe, the workpiece is supported at the end.

(iii) Bed - The main parts of the lathe usually made of Cast iron. provides a heavy rigid frame on which all the main components are mounted.

(iv) Carriage - The carriage is located between the headstock and the tailstock & contains an apron, saddle, compound rest, cross slide & tool post.

(v) Chuck - Chuck allows the mounting of difficult workpieces that are not round, square; or triangular.

(vi) Feed rod - The lead screw is used to move the carriage automatically during threading.

Used to connect the feed box & slide box, & transmit the ^{speed &} power of the feed box to the slide box.

(vii) Lead Screw - The screw is specially set to bend various threads. When bending other surfaces of the workpiece, only smooth screws are used instead of screws.

(viii) Chip Pan — It is present at the bottom of the lathe. A chip pan is used to collect the chips that are produced during the lathe operation.

(ix) Hand wheel — It is the wheel that is operated by hand to move a Cross Slide, Carriage, tailstock, & the other parts that have a handwheel.

(x) Cooling device — The cooling device primarily uses a cooling water pump to supply the slotted fluid in the water tank & spray it to the cutting locations, wash the chips, & lower the cutting temperature.

(xi) Legs — They are supports that carry the entire weight of the machine over them. The prevailing method is to use cast legs.

(xii) Slide box — This is the control box for the feed movement of the lathe. It is furnished with a mechanism that turns the rotary motion of the lead rod & the lead screws to the linear motion of the tool post.

(xiii) Gear box — Inside the headstock, providing multiple speeds with a geometric ratio by moving levers.

(xiv) Spindle - Hole through the headstock to which allows shafts that are up to 2 times the length between lathe centres to be worked on one end at a time.

(xv) Cross slide - Mounted on the traverse slide of the carriage, & used a handwheel to feed tool into the workpiece.

(xvi) Tool post - To mount tool holders in which the cutting bits are clamped.

(xvii) Guide ways - To ensure the accurate movement of tailstock & carriage on the bed. Comes in outer or inner ways.

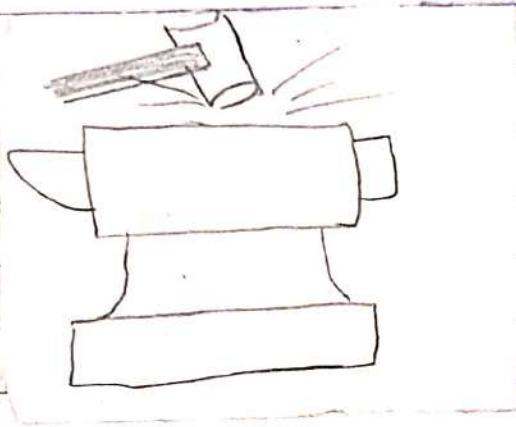
(xviii) Apron - Attached to the front of the carriage, it has the mechanism & controls for moving the carriage and cross slide.

11. Discuss with diagrams the tools used for forging.

Ans:- The tools that are used for forging are include anvil, chisel, tong, fuller, hammer, press, die flatter, punch and drift, swage, swage block, clamping vice, and hearth.

(i) Furnace or hearth - These forging tools are used by blacksmiths for heating metal pieces. They usually consist of four legs, cast iron or steel body, iron bottom, a chimney, & a blower blower.

(ii) Anvil -



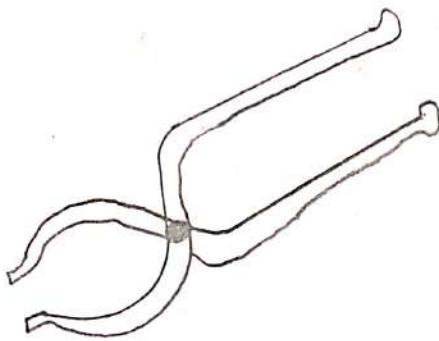
It serve as workbench for blacksmiths. It is a large slab of metal usually made of Steel. It is used to perform different operations like, flattening metal surfaces & obtaining shapes.

(iii) Chisel -



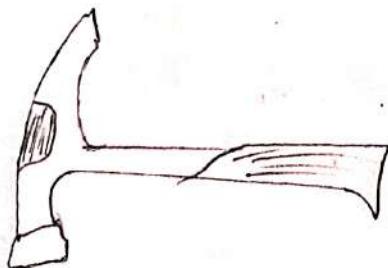
Chisel is used for cutting and chipping out metal. It is made of high petroleum steel with an octagonal cross section with a taper-tapered cutting edge on one end.

(iv) Tong -



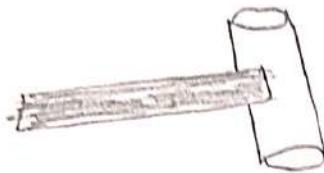
Used in transporting the heated metal to the anvil. It is designed to provide adequate gripping of different metal shapes and sizes.

(v) Fuller -



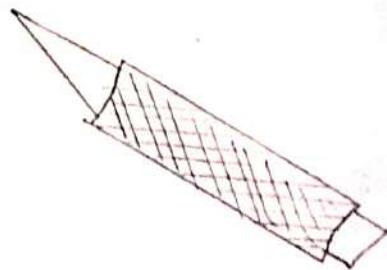
Fuller helps to Create groove or indentions in the forging process . It is also used to stretch the metal .

(vi) Hammer - Hammer Scares as a



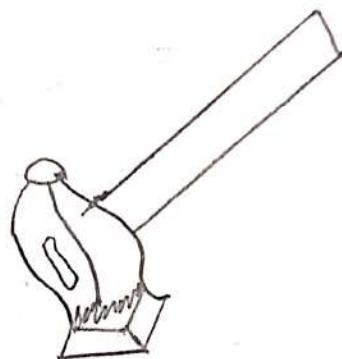
Hammer Scares as a forging tool used in achieving shapes on work pieces . It is used as a striking tool and can be classified as drop hammer and forced hammer .

(vii) Punch and drift -



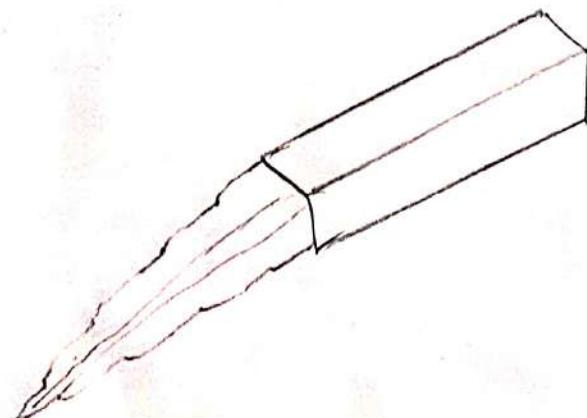
These types of forging tools are made of high Carbon Steel which helps in making hot hole on hot metal pieces.

(viii) Flatter -



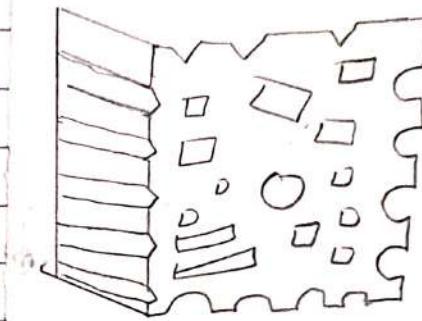
This forging tool is used to flatten the surface of the work piece. It consists of a plane face joined with a straight shank.

(ix) Swage -



Swage is a forging tool type that gives various shapes to the work piece. It is made of high carbon steel.

(x) Swage block —



This forging equipment is made of Cast iron or Cast Steel rectangular block, having several holes in it. The holes are made of different sizes & shapes.

(xi) Set hammer —



Set hammer is a forging tool used for making surface plane, forming and making corners.

(xii) Clamping Vice - this forging equipment is used in holding workpieces in the Smithy. It consists of two jaws, a spring and a flat bottom.

(xiii) Bick Tiron - It is hardened. It has a tapered tail at one side and the other portion is similar to the horn of an anvil.

(xiv) Press - this forging equipment uses excessive pressure to fold metal into the desired shape.

(xv) Forging dies - this forging equipment is required to properly mold metal. It serves as molds into which malleable metals are pressed.

(a) open die

(b) closed die

12. Differentiate between welding tools and forging tools.

Ans: The difference between welding tools and forging tools are :-

The welding tools include the welding machine, power supplies, & device directly used to conduct the welding process, jigs & fixtures.

for the rapid assembly of the parts to be welded,
for holding the parts during welding, and for
preventing or reducing wastage of the welded articles.

While, Forging tools are used for
Moving, Clamping, Supporting, & measuring forging
stock during forging and stamping operations.

Examples of welding tools are welding helmet,
welding gloves, MIG welding pliers, Chipping
hammer, electrode, electrode holder etc.

While, Examples of forging tools
are Anvil, chisel, tongs, fuller, Swage block,
Hammer, punch etc.

Welding and allied processes

1. What do you understand by the term Welding?

Ans: Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both forming a joint as the parts cool.

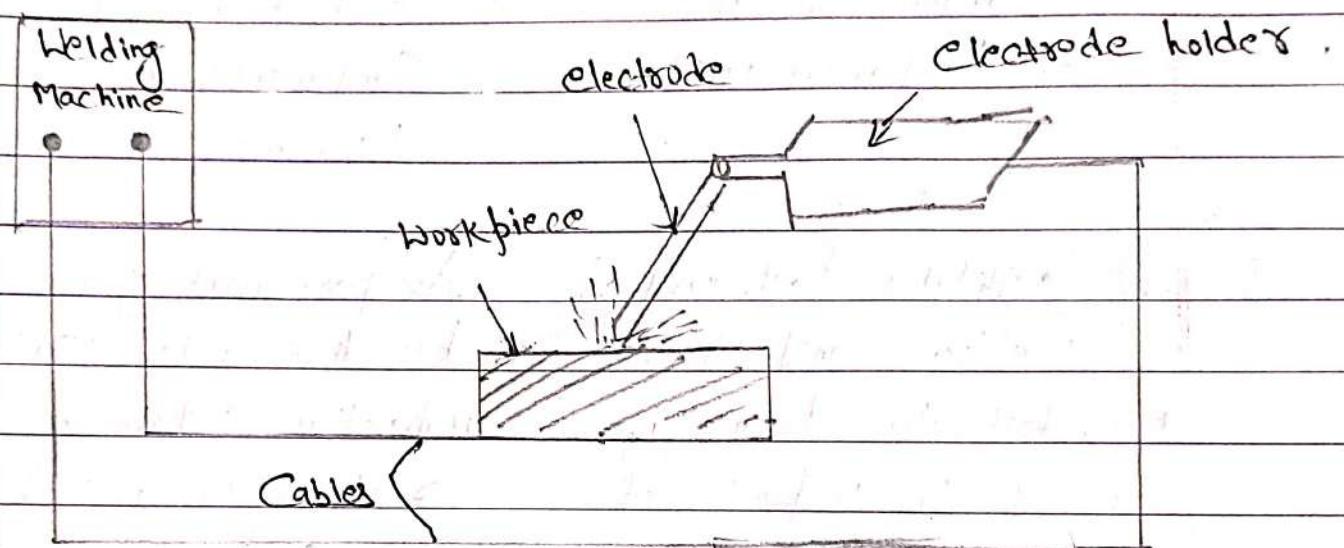
2. State the Welding Concepts for particular Materials with suitable examples.

Ans: Every particular object which can either be welded or casted as a particular concept or idea which need to be fulfilled. The welding procedures for a different types of welding can differ from metal to metal but at the same time will conclude to one particular area i.e either to join, to cut or to melt.

3. Briefly Explain with diagrams & Examples of the Concept of welding.

Ans: These include metal inert gas (MIG) welding, Stick welding, tungsten inert gas (TIG) welding.

also known as gas tungsten arc welding (GTAW), gas welding, metal active gas (MAG) welding, flux welding, cored (FCAW), gas welding metal (GMAW), Submerged arc welding (SAW), shielded metal arc welding (SMAW) & plasma etc.



4. Differentiate between permanent weld and temporary weld.

Ans: The difference between permanent weld and temporary weld are :-

Temporary Weld

① All such joints that allow easy disassembly of assembled structure without deforming the components are called temporary weld.

Permanent Weld

All such joints that don't allow dismantling of assembled structure without breaking the components are called permanent weld.

② It facilitates fast, easy & cost efficient inspection. No destructive testing is required for inspection of joints. Repair & replacement are also easy.

As permanent joints cannot be dismantled easily, so inspection, repair & replacement are difficult & costly.

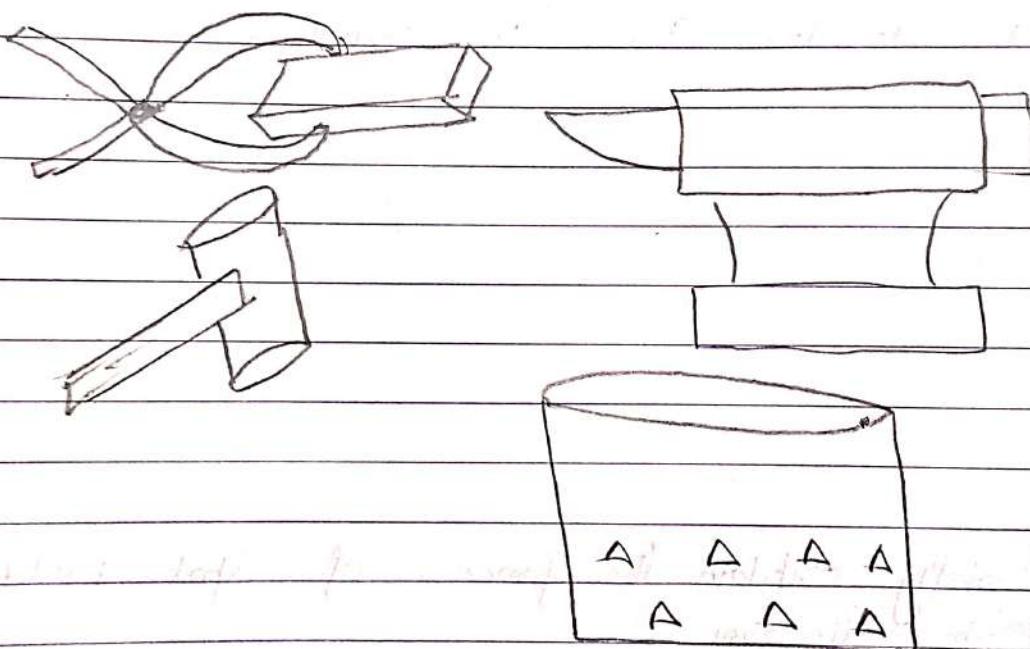
③ Temporary joints are suitable where frequent separation of assembled components is required.

Permanent joints are suitable for such application where separation is usually not desired in the service life.

5. Discuss with diagram the procedure of forge welding.

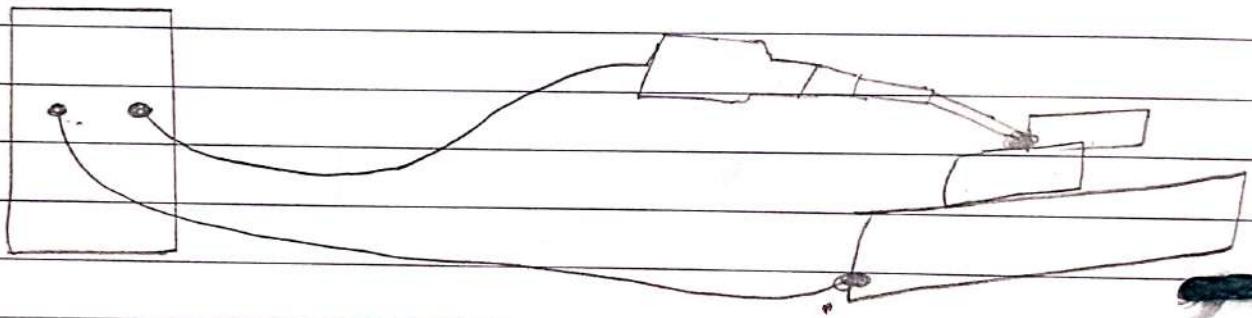
Ans:

It is the oldest type of welding, in this type of welding metals heat on furnace to the red hot level and then hammer them together on the anvil through hammer to form a welded joint. It is also called Smithy welding. It is used to join steels or iron, gates, prison cells etc., used to weld weapon like sword, shotgun barrels etc.



6. Briefly explain the process of electric arc welding with diagram.

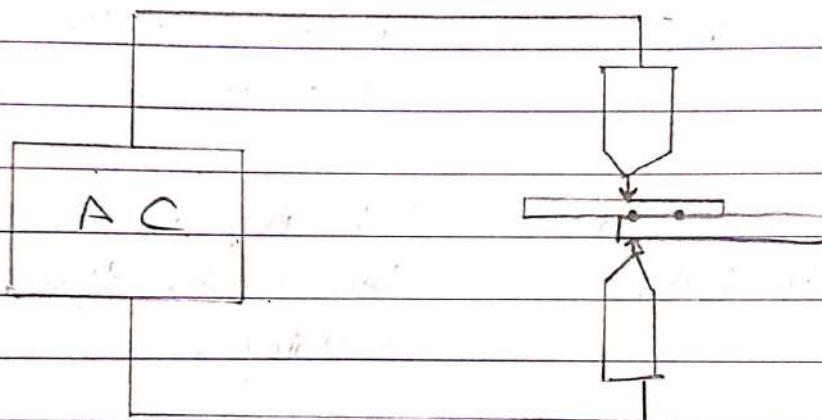
Ans: It is also known as fusion welding in this type of welding we use various components such as DC generator or rectifier, Two Conductors of Electricity (Anode & Cathode), two electric cables - one connect to electrode holder & other connect with gripper, finally, It melts or heat the working piece & then It will fuse two working piece, two similar or dissimilar metals joint by melting the welding position & then It will convert flux into Slag Coating for coolant.



7. Briefly explain the process of spot welding with diagram.

Ans: In Spot welding procedure, the machine has two jaws upper & lower - the upper jaw is movable and the lower jaw is fixed, which are connected by a foot paddle. The spot welding process is basically

used to weld sheets with the help of direct waves i.e. the sheets to be welded are put in the line of action of the two jaws or pin, which generates high current and tremendous rise in temperature. Due to the high available current & low voltage, the sheets are welded together at particular points.



Q. Differentiate between Alternating Current & Direct Current welding ..

Ans : The differentiate between Alternating Current welding and direct Current welding are as follows :-

Dc arc welding.

① The power Consumption by the Dc arc welding is high.

② The efficiency of Dc arc welding is low

③ The Cost of Dc arc welding is high.

Ac arc welding

Power Consumed by the Ac arc welding is lower than that of Dc arc welding.

The Ac arc welding is more efficient than Dc arc welding.

The Ac arc welding is less costly than Dc arc welding.

9. Differentiate between Welding Voltage and Striking Voltage.

Ans: Welding Voltage is the Voltage that exists between the electrode & the job during welding. While, Striking Voltage is the Voltage at which electrical breakdown occurs in a gas. Also known as breakdown potential, Sparking potential.

10. Discuss the equipments of electric arc welding machine.

Ans :- The Various equipment required for the electric arc welding (AC and DC) :-

- (i) Welding Machine - used for electric arc welding
- (ii) Electrode holder - used for holding the electrode at a desired angle.
- (iii) Leads or Cables - Carry the electric current from the welding machine to the workpiece.
- (iv) Tugs or Cable Connectors - used for making the connection between machine switches and welding electrode holder.
- (v) Work piece.
- (vi) Transformers

11. What are the equipments used in the process of electric arc welding?

Ans : Following are the equipments used in the process of electric arc welding :-

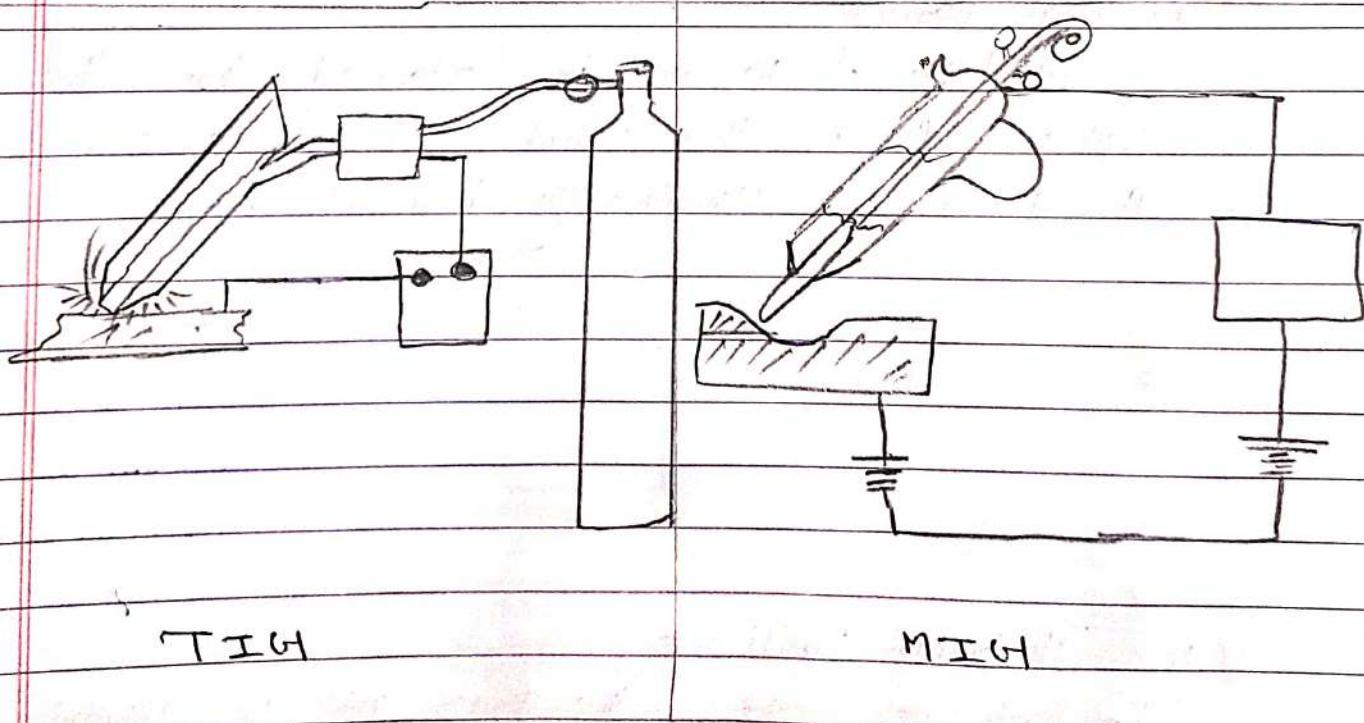
- | | |
|------------------------|-------------------------------|
| (i) a power source | (vi) Hand Screen |
| (ii) welding cables | (vii) Protective Clothing |
| (iii) electrode holder | (viii) Welding Screen |
| (iv) Clipping hammer | (ix) AC or DC welding machine |
| (v) wire brush | |

12. Define the following :

- (i) Soldering - Soldering is a joining process used to join different types of metals together by melting Solder. Solder is a metal alloy usually made of Tin and Lead which is melted using a hot iron.
- (ii) Electrode - An electrode is an electrical conductor used to make contact with a non-metallic part of a circuit. Electrodes are essential parts of a batteries.
- (iii) Brazing - Brazing is a metal-joining processes in which two or more metal items are joined together by melting and flowing a filler metal into the joint.
- (iv) Earthing wire - A metallic body of high power taking electrical equipment to earthed by ground wire, that protects us from electrical shocks.
- (v) Transformer - A transformer is a device that transfers electric energy from one Alternating Current Circuit to one or more other Circuit.

13. Explain with diagram the process of TIG welding and MIG welding with neat diagram.

Ans: TIG welding uses a Consumable tungsten electrode with a shielding. MIG and TIG welding are common types of welding with a number of similarities as they both use an electric arc and a shielding gas. However, there are a number of differences between the two processes including with the welding electrode used to create the arc. MIG uses a solid wire that is machine-fed to the weld area while TIG uses a non-consumable electrode.



14. Mechanical Working of metals

14. Discuss the position of welding with suitable diagram and examples.

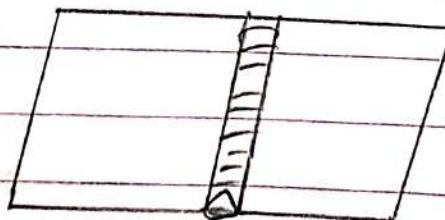
Ans: Welds with a T-arc flat position

Following are the position of welding :-

- (i) Flat position.
- (ii) Horizontal position
- (iii) Vertical position
- (iv) overhead position.

(i) Flat position -

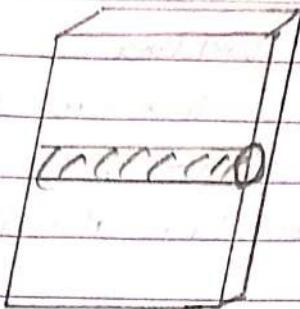
This type of welding is performed from the upper side of the joint. The face of the weld is approximately horizontal.



(ii) Horizontal position -

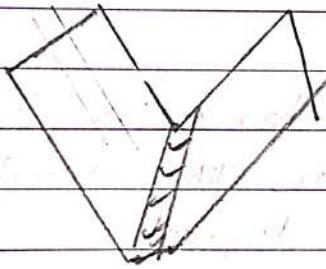
In horizontal welding, the weld axis is approximately

horizontal, but the weld-type dictates the complete definition.



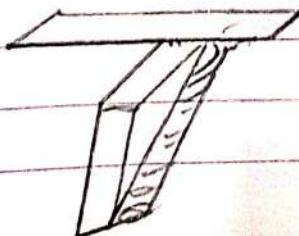
(iii) Vertical position -

In Vertical position welding, the axis of the weld is approximately vertical.



(iv) Overhead position -

Overhead welding is performed from the underside of a joint. In overhead welding, the metal deposited tends to droop or sag on the plate, causing the bead to have a high crown.



15. Define the following :

(i) Atomic hydrogen welding

» Atomic hydrogen welding is an arc welding process that uses an arc between two tungsten electrodes in a shielding atmosphere of hydrogen.

(ii) Butt welding .

» Butt welding is when two pieces of metal are placed end-to-end without overlap and then welded along the joint .

(iii) Gas welding .

» Gas welding is the process of using heat generated from burning a fuel gas like acetylene to cut and / or join metal together .

(iv) Resistance welding .

» The high quality butt welding joints were impact loaded by the freely dropping 3000 kg mass hammer of the die forging hammer .

Mechanical Working of Metals

I. Difference between Rolling and Extrusion.

Ans: The difference between rolling and extrusion are :-

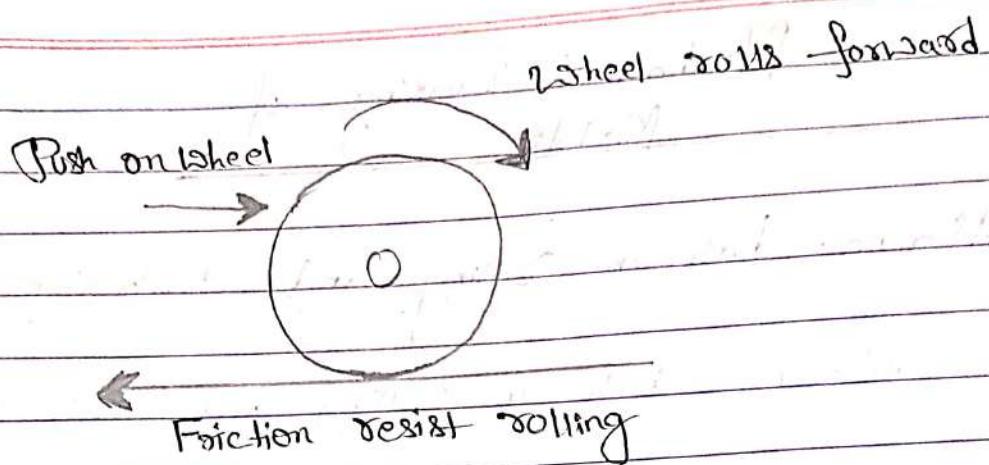
Rolling can be used to offer desired shape to the metal like Section, T-Section, I-Section, channel section. It is also practiced in order to provide final shapes to applications like rods, sheets, strips & pipes.

While, Extrusion is a manufacturing process used to create objects of a fixed cross-sectional profile.

2. Define the following with diagrams.

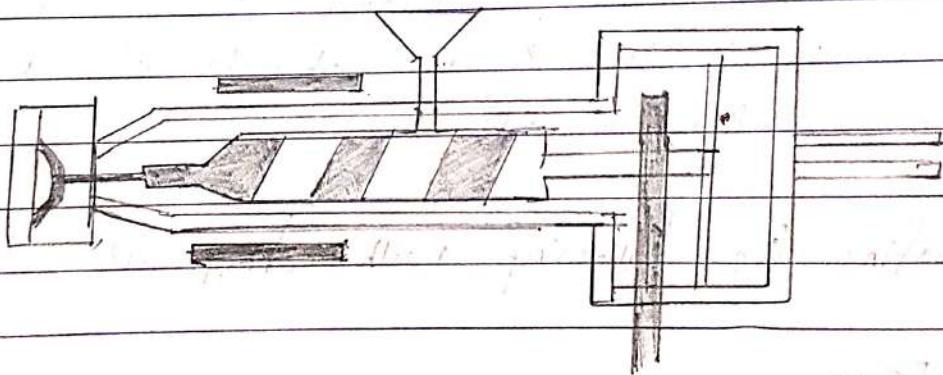
(i) Rolling —

Rolling is a metal forming process in which metal stock is passed through one or more pairs of rolls to reduce the thickness.



(ii) Extrusion - e

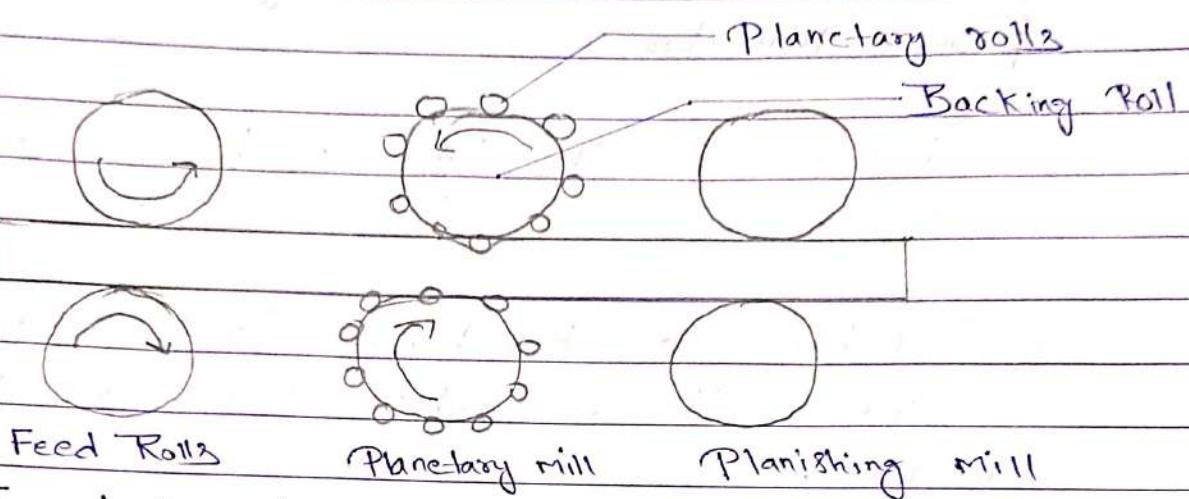
Extrusion is a process where a material undergoes plastic deformation by the application of a force causing that material to flow through an orifice or die.



(iii) Cluster mill -

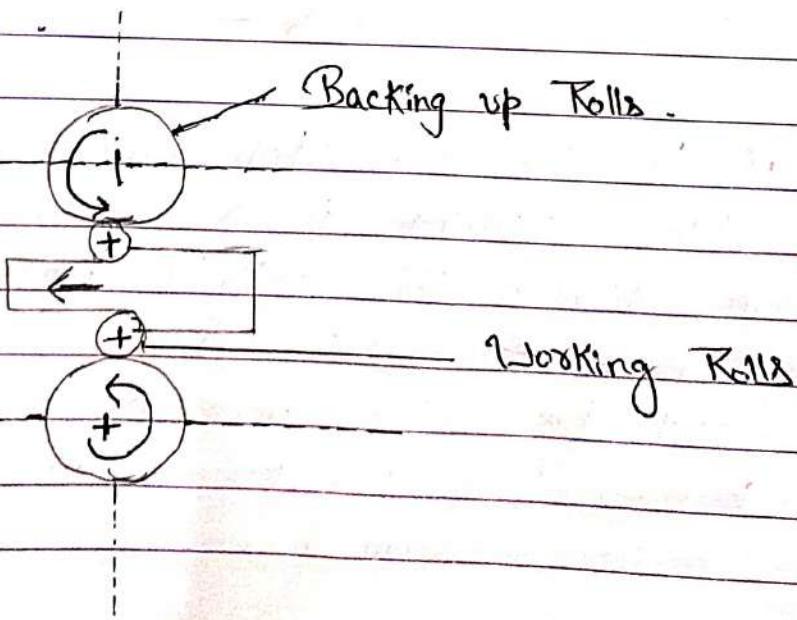
A cluster rolling mill is a special type of four-high rolling mill in which each of the two working rolls is backed up by two or

mode of the larger backup rolls which are able to roll hard materials.



(iv) Four high rolling mill -

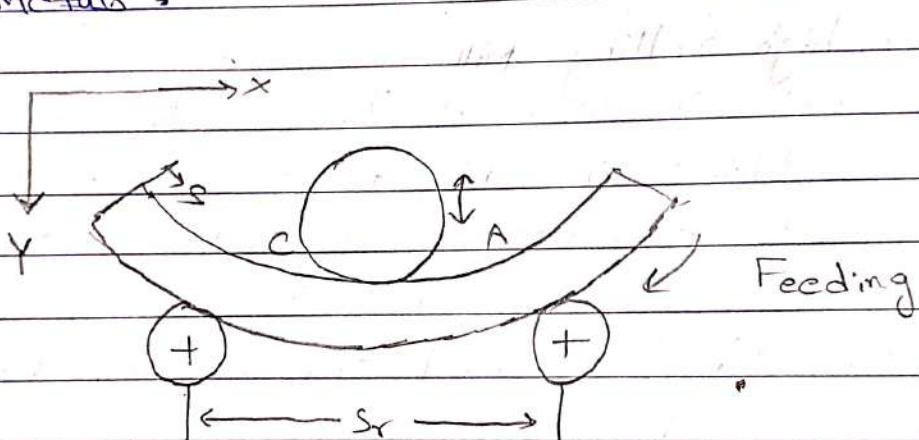
Rolling mill consisting of four rolls or known as four high rolling mill is used for reducing material to extremely small thickness. Though the use of larger backup rolls, the issues of roll deflection can be avoided and smaller work rolls can be used.



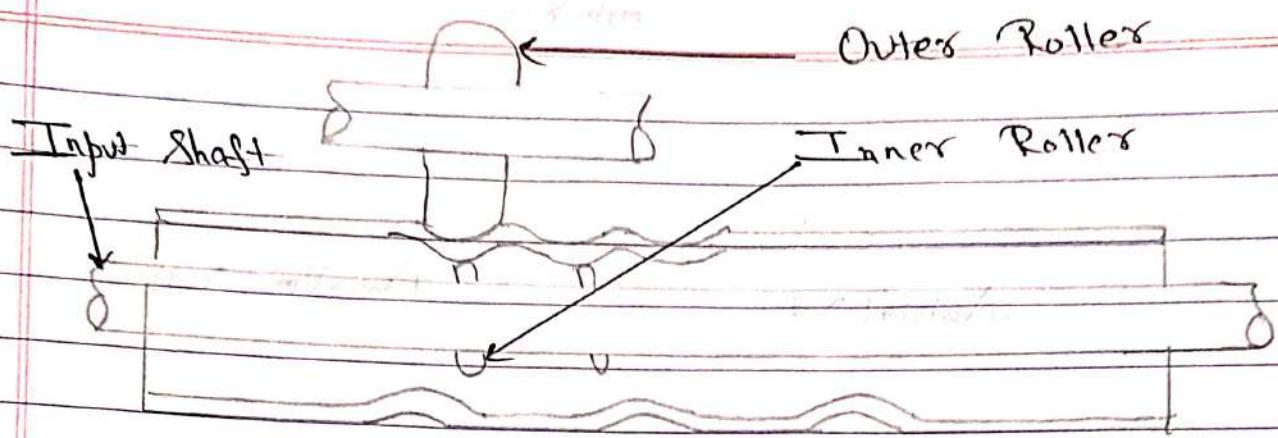
3. Discuss the types of process for rolling. Also provide suitable & neat diagrams for every process indicator.

Ans: Following are the types of process for rolling :-

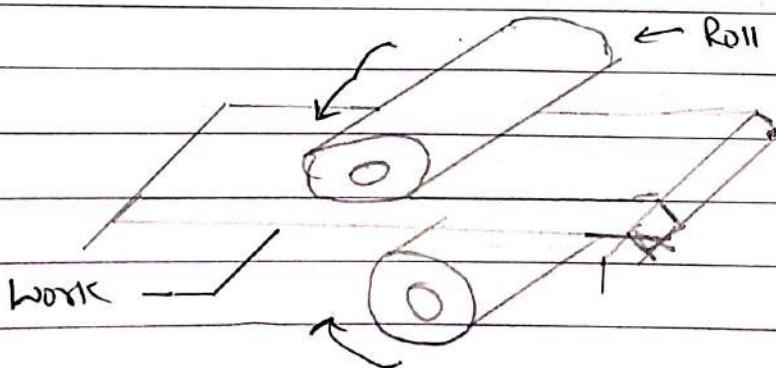
(i) Roll bending - Roll bending produces a cylindrical shaped product from plate or steel metals.



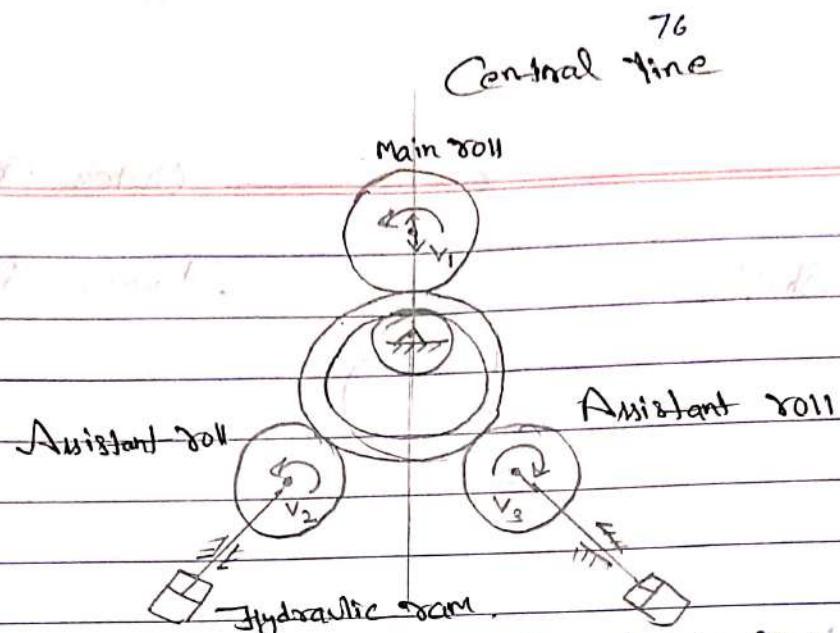
(ii) Roll forming - Roll forming, roll bending or plane rolling is a continuous bending operation in which a long strip of metal is passed through consecutive consecutive sets of rolls, or stands, each performing only an incremental part of bend, until the desired cross-section profile is obtained.



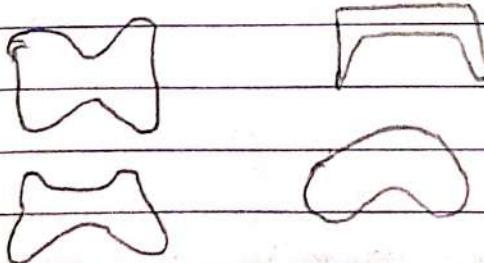
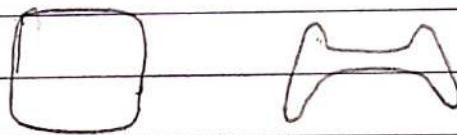
(iii) Flat Rolling - Flat rolling is the most basic form of rolling with the starting and ending material having a rectangular cross-section. The material is fed in between two rollers, called working rolls, that rotate in opposite directions.



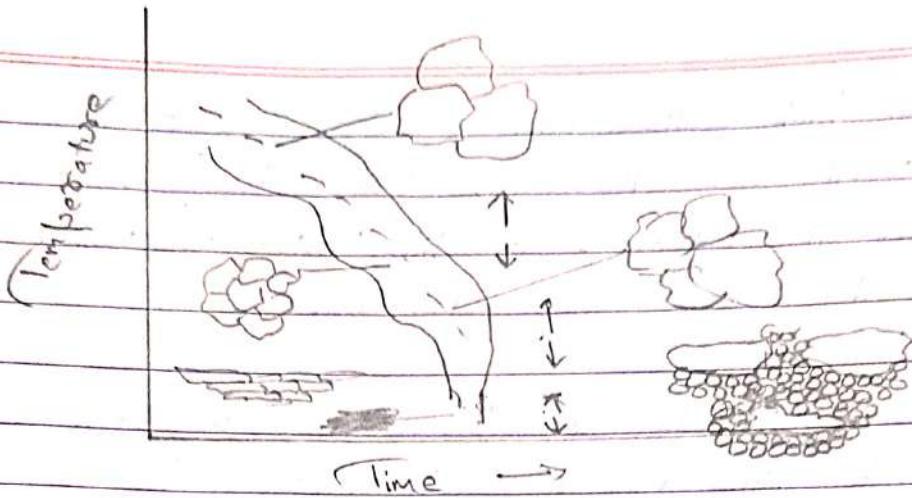
(iv) Ring rolling - Ring rolling is a specialized type of hot rolling that increases the diameter of a ring. The starting material is a thick-walled ring. This workpiece is placed between two rolls, an inner idler roll and a driven roll, which presses the ring from the outside.



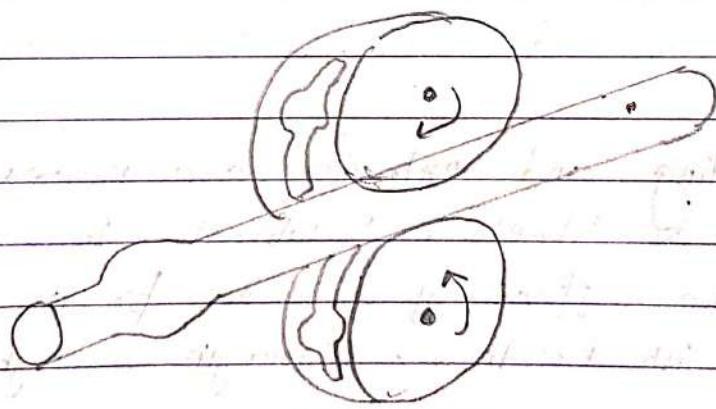
(v) Structural Shape Rolling — Structural shape rolling, also known as shape rolling and profile rolling, is the rolling and roll forming of structural shapes by passing them through a rolling mill to bend or deform the workpiece to a desired shape while maintaining a constant cross-section.



(vi) Controlled rolling — Controlled rolling is a type of thermomechanical processing which integrates controlled deformation and heat treating.



(Vii) Forge Rolling - Forge rolling is a longitudinal rolling process to reduce the Cross-Sectional area of heated bars or billets by leading them between two contrary rotating roll segments. The process is mainly used to provide optimized material distribution for subsequent die-forging processes.



4. Difference between two-high rolling mill, three-high rolling mill & cluster mill.

Ans: The two-high rolling mill consists of a two-high stand with two horizontal rolls, placed exactly one over the other. In this type of mill, one or both the rollers are adjustable.

Rolling mill Consisting of three rolls or known as three high rolling mill is typically used for performing multiple reduction passes by wrapping material around the center mill roll and performing another reduction on the opposite mill roll pair.

A Cluster rolling mill is a special type of four high rolling mill in which each of the two working rolls is backed up by two or more of the larger backup rolls which are able to roll hard materials.

5. Why rolling and extrusion are necessary for materials or sheets. Elaborate the answer showing the effect of both the process in terms related with hardness, Strength, toughness & size.

Ans: Rolling and extrusion are used to shape and form materials, such as metal sheets, into specific shapes and sizes.

Rolling is a process where a material is passed through a set of rollers, which compress and shape the material.

The rollers can be adjusted to create different thicknesses and shapes.

This process is often used to create sheets of metal with a consistent thickness and width.

Additionally, rolling can also be used to strengthen the material by aligning the grains of the metal in a specific direction.

Extrusion is a process where a material is pushed through a shaped die, which forms the material into a specific shape.

Extrusion can be used to create a wide range of shapes, including rods, tubes & profiles.

This process is commonly used for creating metal parts with complex shapes.

Both rolling and extrusion are necessary in order to create specific shapes and sizes of materials that meet the needs of various applications.

They can also be used to improve the mechanical properties of materials like ductility, strength & toughness.