

FAMILIARIZATION WITH WORKSHOP

Objectives: Student should be able to:

1. Name different types of workshops and their application.
2. List various processes carried out at workshop at different shop.
3. Name different types of layout and their importance.
4. State the role of engineer in a workshop.

Introduction:

The word workshop is a combination of two separate words "work" and "shop". Regarding work, Mr. Webster says, "work is a physical or intellectual effort directed to some end". Either one, physical effort or intellectual effort if taken alone is drudgery, if properly combined it produces enthusiasm.

Shop directs us to place where this work is being properly utilized. So workshop is the place where physical or intellectual efforts get proper utilization.

Every engineer in one way or other is associated with workshop, irrespective of the discipline he/she might be studying in.

It is very important to get familiar with workshop i.e. to know:

1. Basic types of workshops.
2. Types of work carried out.
3. Various departments in workshop, their functions & responsibility.
4. Various types of workshop layouts.

There are three basic types of workshops:

1. Training workshop
2. Production workshop
3. Repair and Maintenance workshop

Ans 1. There are mainly four type of layout :

- (a) Product as line layout
- (b) Process or functional layout
- (c) fixed position or position layout
- (d) Combined or group layout

(a) product as line layout :

In a product layout, high volume goods are produced efficiently by people, equipment as departments arranged in an assembly line. i.e lines of workstations at which already made parts are assembled.

(b) process or functional layout :

In process layout, work station and machinery are not arranged according to particular production sequence. Instead there is an assembly of similar machinery or similar operations in each departments.

(eg: a drill department, a paint department etc--)

(c) fixed position or position layout :

In this type of layout, the major component remain in a fixed location; other materials, parts, tools, machinery, man power & other supporting equipments are brought to this location. This layout is ideal for products that are large, heavy to move. This type of layout is used in manufacture of boilers, hydraulic & steam turbines & ships etc.

(d) Combined or group layout :-

Certain manufacturing units may require all three processes namely intermittent process (job shops), the continuous process (mass production shop) & the representative process combined process (miscellaneous shop). In most of industries, only a product layout / process layout or a fixed location layout does not exist. Thus, in manufacturing concerns where several products are produced in repeated number with no likelihood of continuous productions, combined layout is followed.

Ans-2 Machines & its functions in our workshop-

- (a) Chisel machines - cut a round hole through timbers.
- (b) Wooding wood - cut wood in cylinder shape.
- (c) planes with ratus saw - cutting purpose.
- (d) fitte size with gripping attach - Supporting purpose.
- (e) Hucksaw, machine - to cut metals.
- (f) Hot air oven - Use dry heat to sterilize.
- (g) Bench grinders - Drive abrasive wheels.
- (h) Spot machine - welding purpose.
- (i) Drilling machine - Drilling purpose.
- (j) Hand shear machine - for cutting
- (k) Jig welding machine - for welding
- (l) FRC welding machine - for welding
- (m) MIG welding machine - for welding
- (n) power press - for pressing job
- (o) shaping machine - to give design / shape
- (p) Radial drilling machine - for drilling
- (q) Surface grinders - Drilling purpose.

- (b) power hammers - for hammering metal
- (c) sand makes - mixing sand & grinding
- (d) anvil - metal is placed or shaped on it.

Ans-3 Role of engineers in a workshop :

- An engineer should understand general procedure of routine in workshop, such as allotment of work, material and inspection, repairing etc.
- Ability to lead, guide & control the groups of person & take decisions without confusions.
- Shop disciplines such as carrying out orders & instructions, punctuality of work, your subordination.
- Sense of cleanliness & neatness about workshop of manpower, time & materials.
- Cost consciousness. i.e reducing cost whenever possible.
- Safety, which factors will lead to safety of personnel, equipments both.

Ans-4 Automobile industry - An example of mass & continuous production.

- (b) Garment Industry - Batch industry
- (c) Furniture industry - Batch production or job production
- (d) Textile manufacturing company - Continuous production
- (e) pharmaceutical industry - Job production industry.

SAFETY ASPECTS IN WORKSHOP

Accidents are mishappenings which results in loss of life and property. Accidents occurring in the industries are called industrial accidents. These are generally due to faulty equipment and machinery or negligence on the part of the workers.

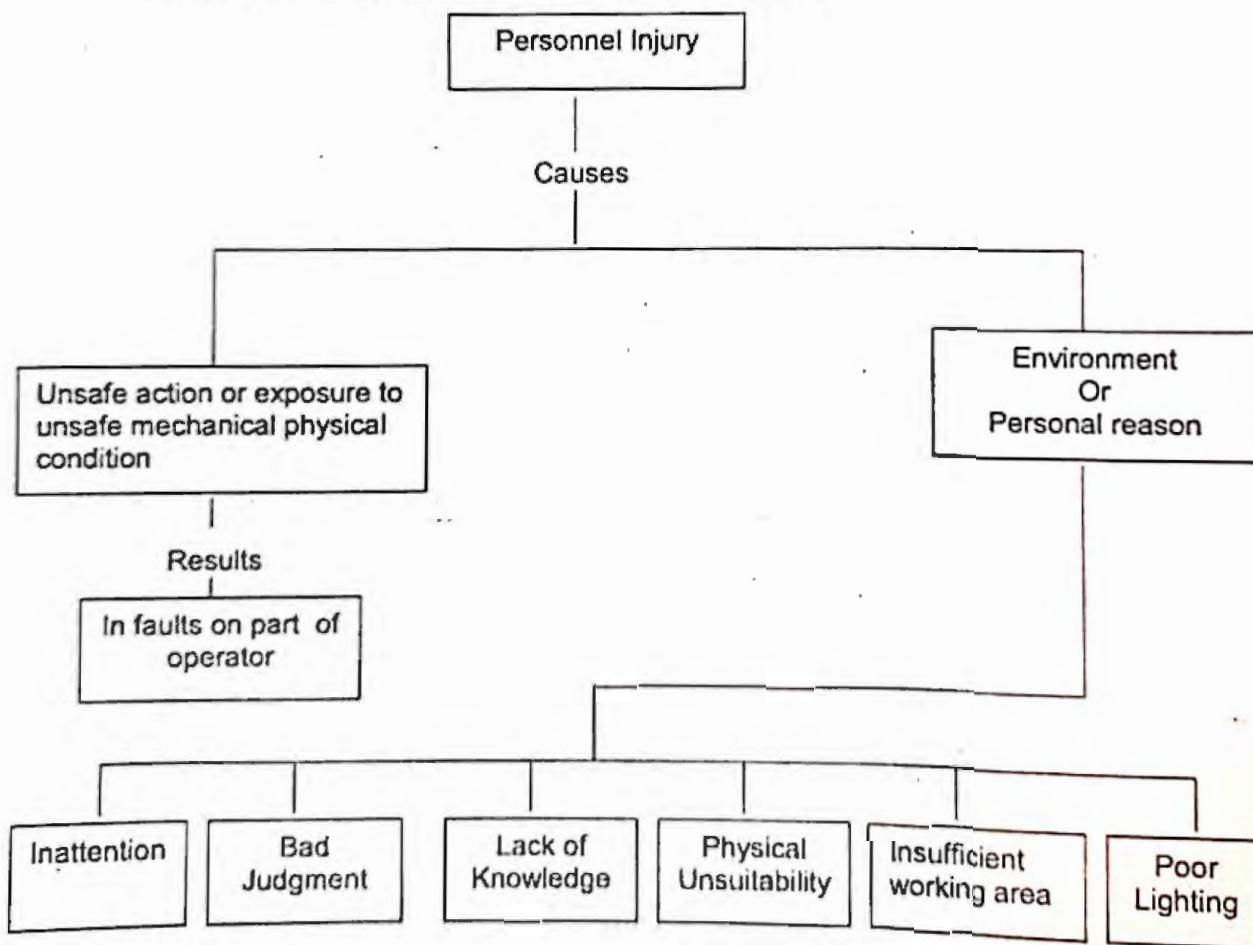
Definition:

An event or mishappening that occurs unplanned and unexpected, which may cause or likely to cause an injury is called an accident.

Characteristics of Accidents:

1. Accidents are unfortunate, sudden happenings about which nothing is known in advance.
2. Life and property are affected by accidents.
3. Due to accidents, work is stopped for a certain length of time.

The following chart can explain the accidents occurrence.



EXERCISE

1. "Accidents do not happen, they are caused". Discuss.
2. Explain how an accident affect the product cost ?
3. Fill in the blanks of the following.
 - (a) Accidents begin where safety _____
 - (b) Make safety a _____
 - (c) When _____ your family also suffers.
 - (d) Accidents do not happen but they are _____
4. Write any three quotations / slogans on safety.
5. Write a short note on fire extinguishers.

Ans - 1

Accidents are mishappening that occurs unplaced or unexpectedly which results in an injury or loss of life and property. Accident doesn't "just happen". There are caused by actions or inactions of one or more people. It can be caused due to faulty equipments or else by negligence on the part of weakness. e.g. If we are working & if we are in a hurry or not attentive, we may fall. In industries, accident can be caused, due to lack of proper knowledge.

However, just as people cause accident to happen, they can prevent them from happening by following safety tools. Remembers, when you are tempted to take a shortcut or break a safety tools "just this once" or "just for a minute"---- that '1 min' could be exactly when accidents doesn't happen but still it is caused! so, No result rules or work practice can stop accident from happening. Only "You can" "your own" safe behaviour" is your own "greatest safeguard".

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- Ans-2 Accident can effect product cost directly or indirectly.
- Direct cost :
 - Compensation & medical expenses are direct cost of accidents.
 - Indirect cost :
 - Loss of time & injured employees & other employees.
 - Loss of time of supervisor & man.
 - Cost of damage to machine or equipments.
 - Loss of profit due to less productivity.
- Directly or indirectly, the accident put heavy burden on society. It directly or indirectly leads to increase in cost of final product. Thus in a sense, every citizen has to bear a proportion of cost of accidents.

- Ans-3
- (a) Accident begin when safety LACKS.
 - (b) Make safety a PRIORITY.
 - (c) when ACCIDENTS HAPPEN TO YOU your family also suffers.
 - (d) Accident doesn't happen but they are CAUSED.
- Ans-4
- " Safety is a state of mind - Accidents are an absence of mind."
 - " Safety starts with 's' but it begins with you."
 - " When safety is first, you last."

Ans 5

A fire extinguisher is an active fire protection device used to extinguish or control small fire, often in emergency situations.

- Fire extinguisher contains different chemicals depending on the applications.
- Types: (i) Hand-held ; (ii) - cast mounted.
- Handheld extinguishers weigh from 0.5 kgs to 14 kgs. and they are portables.
- Cast mounted units typically weight more than 23 kgs. They are usually found at airports, construction sites etc.
- If we remove any one of the resources in the fire triangle i.e fuel, heat or oxygen, then fire can be controlled. It is generally cut-off the supply of oxygen to control fire.
- Nowadays, Fire extinguishers are necessary for every place.

FAMILIARIZATION WITH MEASURING INSTRUMENTS

Objective:

Students should be able to:

1. Demonstrate proper use of various measuring instruments and gauges.
2. Select proper instrument for particular application.

Introduction:

Measurement provides the fundamental basis for research, development and manufacturing processes. The knowledge of measurement is of immense importance; without this knowledge, assembly of engineering components and their functions cannot be properly performed.

Measurement is an act of quantitative comparison between a predefined standard and an unknown component.

Measuring instrument is a device that may be used to obtain a dimensional or surface measurement. Measuring instrument is used for measurement and inspection to establish the manufacturing accuracy of parts. They help to timely detect inaccurately machined part and to avoid rejection and defects.

Classifications of measuring instrument:

Measuring instrument may be classified as below:

(1) Type of measurements:

(a) Linear (b) Angular (C) Taper (4) Comparative

(2) Direct and Indirect measurement:

(3) Precision and Non precision instruments:

1. LINEAR MEASUREMENTS:

NON PRECISION	1. STEEL RULE 2. CALIPERS 3. DIVIDERS 4. TELESCOPIC GAUGE 5. DEPTH GAUGE
PRECISION	1. MICROMETER 2. VERNIER CALLIPER 3. HEIGHT GAUGE

Ans-1

The various non-precision instruments are:

(i) Steel rule:

Used in shop for taking linear measurements of blanks upon an accuracy upto 0.5 mm.

(ii) Calipers:

Used to transfer & compare a dimension from one obj. to another or from one part to a scale or micrometers where measurement can't be directly taken.

(iii) Dividers:

Used to transfer dimension, scribing circles & doing general layout work.

(iv) Telescope gauge:

Used to measure the inside size of slot or holes.

(v) Depth gauge:

Used to measure the depth of blind holes, slots etc.

(vi) Protractor:

Used to measure the angle between two faces of a component.

(vii) Adjustable level:

Used to checking, comparing or transferring angle & laying out work.

(viii) Engineer's square:

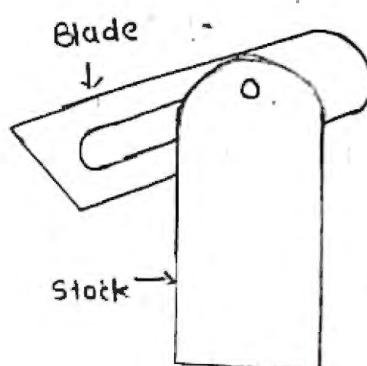
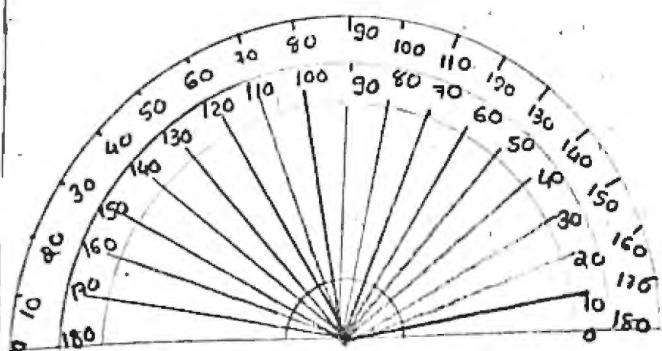
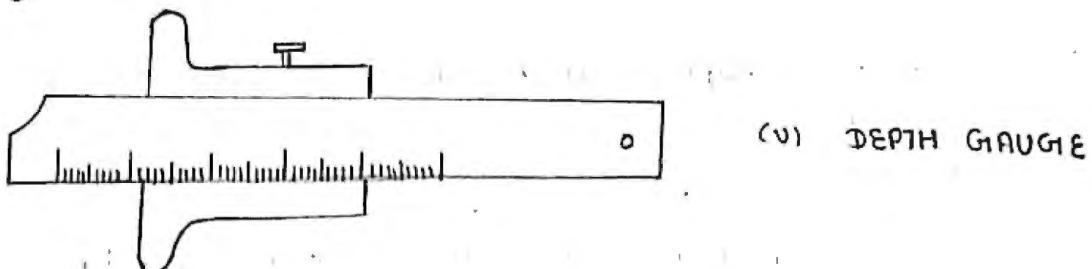
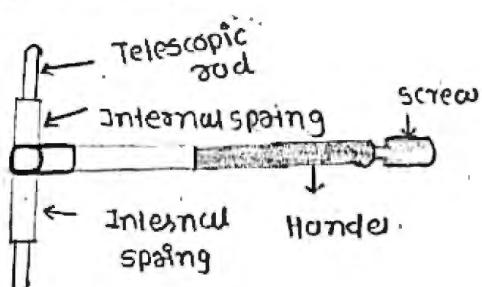
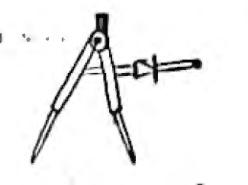
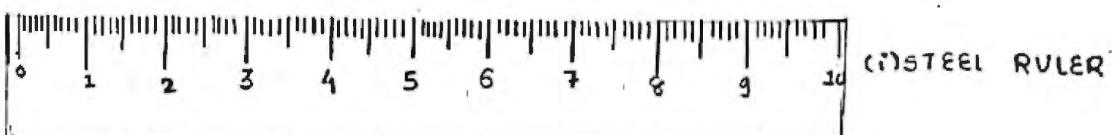
It is used to check surface or right angle w.r.t. base surface.

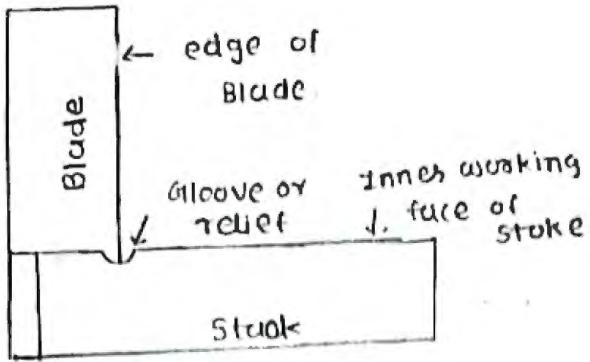
(ix) Combination set :

It combines in one instrument a square head, centre head & level protractor. It is used for fitting and machine shop.



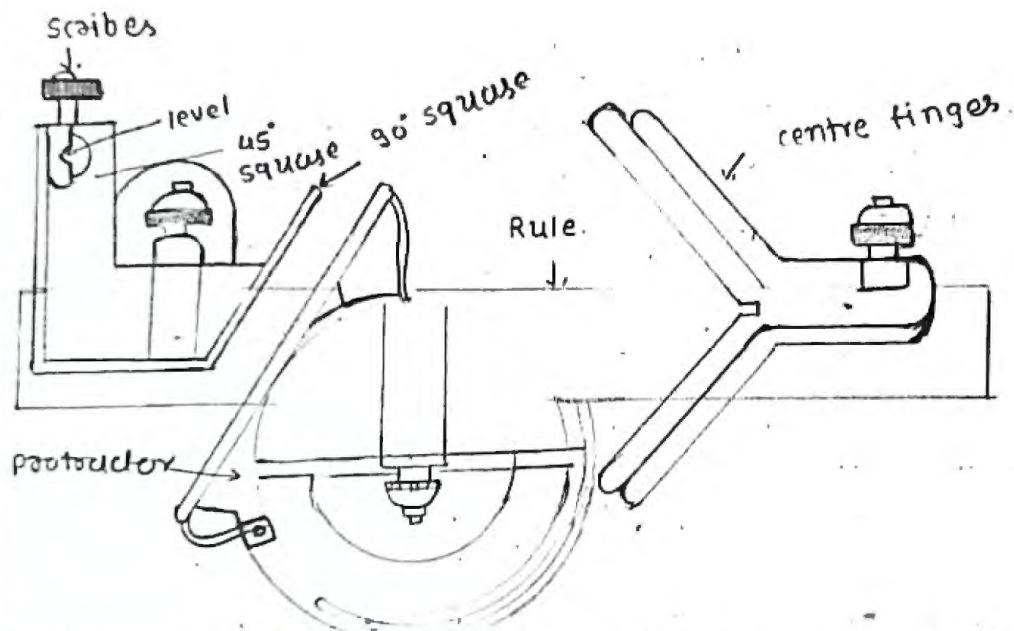
Diagrams :





(viii) ENGINEERING SQUARE.

(ix) COMBINATION SET



Ans-2 Indirect measurement is a method of measuring liquids, gas or solid within a system indirectly. This method is used when it's difficult to test or perform measurements with direct method. All methods and techniques that make use of logs, charts, readouts, interpretation of data & analysis fall under category of indirect measurement methods.

Instrument such as sensors, data interpreters, are used.

Ans - 3. Error of micrometer = -0.25 mm

Reading of micrometer = 45 mm

Error to fix for measurement = 0.25 mm

Actual measurement = Reading of + Error to fix for
micrometer. measurement

$$= 45 + 0.25$$

$$= 45.25 \text{ mm.}$$

Ans - 4

Instrument that can be used to measure the thickness of pipe are vernier callipers or micrometer screw gauge.

Ans - 5

Gauge is used for verifying / confirming known distance, thickness, gap, depth etc. A measuring instrument is used for measuring unknown distance, thickness, gap, diameter, depth.

- (i) plug gauge : It is used for measuring diameters of various components.
- (ii) Depth gauge : It is used to measure depth of blind holes, grooves etc.
- (iii) Ring gauge : It is used to check external diameters cylindrical object.
- (iv) Fillet gauge : It is used to measure gap widths. These are mostly used in engineering to measure the distance between two parts.

FITTING PRACTICE

Objectives: Students should be able to:

1. Name different hand tools and their applications used for fitting work.
2. Demonstrate proper use of various hand tools.
3. Select proper tool for particular application.

Introduction:

Assembly work means bench work and fitting practice. It is the process of removing unwanted material with the help of hand tools, from the given stock for making a component for fitting one part into another part to form a mating or fitting pair.

Bench working and fitting plays an important role in an engineering workshop. The work carried out at the fitting bench vice is called a bench work. e.g. filling, chipping, sawing, drilling, tapping etc. These processes are mainly necessary for assembling parts together after machine work is done.

A considerable skill is required to execute the fitting job and hence lots of practice and concentration is required for fitting job.

EQUIPMENT FOR FITTING SHOP

Fitting shops are provided with equipment for common and individual use. Benches with vices are for individual use, whereas equipment for common use includes drilling machines, tool grinder, filing machines, surface plates, power hacksaw shears, etc.

FITTING TOOLS:-

Following types of tools are used in fitting shop:

1. Holding tools e.g. Bench vice
2. Striking tools e.g. Hammer
3. Cutting tools e.g. Hacksaw, chisel, file etc.
4. Scarping tools e.g. scraper
5. Drilling tools e.g. Drill
6. Marking, measuring and testing tools e.g. marking block, scale, vernier, surface plate, height gauge, "V" block etc.

FITTING PROCESS

A number of hand operations are carried out in a fitting section to finish the work piece to the desired shape, size and accuracy. The operations carried out in a fitting shop are:

Marking, Sawing, Filling, Scraping, Chipping, Drilling, Tapping (internal threading), Dieing (external threading) Reaming etc.

We will discuss marking, sawing and filling processes as they are commonly used.

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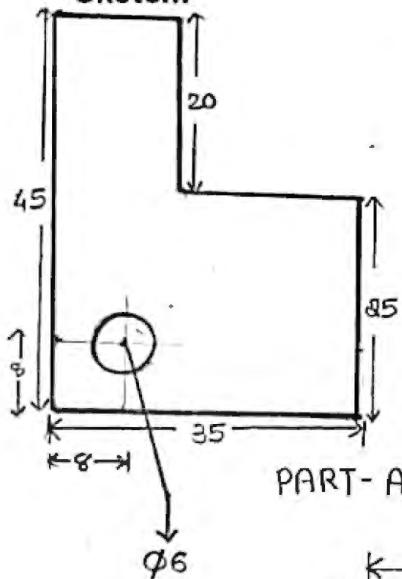
JOB SHEET

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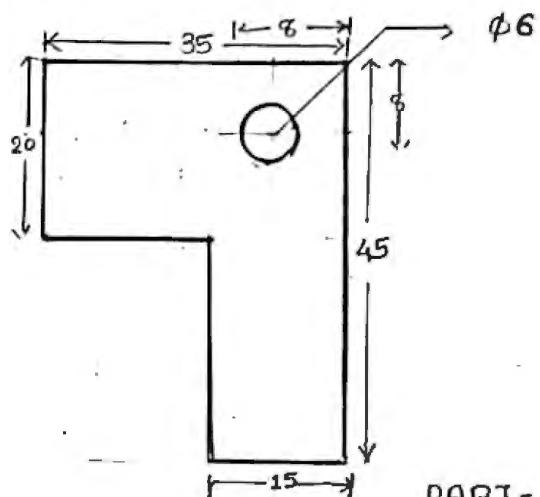
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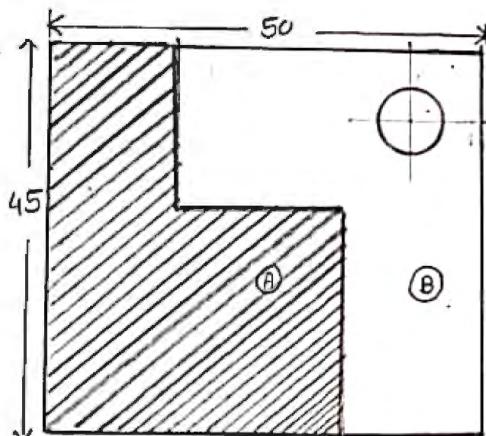
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PART - A



PART - B



PART A & B

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Ans- 1

Steps to be followed in manufacture of job case :-

- With the help of T-squuse, check for two straight sides. If not then, make any two sides straight with the help of files.
- Smoothen one surface of the material, with scrapes. Rub wet chalk on the surface for masking purpose.
- Arrange masking gauge, V-block and scale on a surface plate. mask the dimensions required with the pencil.
- Using the centre punch and hammer, punch light holes on the outline masked on material.
- Using a hucksaw, cut out the undesired material. (Cut all the piece a little away from actual masking to avoid removing extra material. Remove the little undesired part left with a scraper.)
- Lastly, drill the holes as, per drawing, for better appearance of the job manufacture. polish the surface with file.
- Tools :- T-squuse, files, Masking gauge, Scrapes, V-block, Ball-point hammer, centre punch, Hucksaw, surface plate, drilling machine.

Ans- 2

(a) Centre-punch :-

- A centre-punch is used in masking indentations on the metal surface. It provide locations for opration such as sawing, cutting, drilling etc.

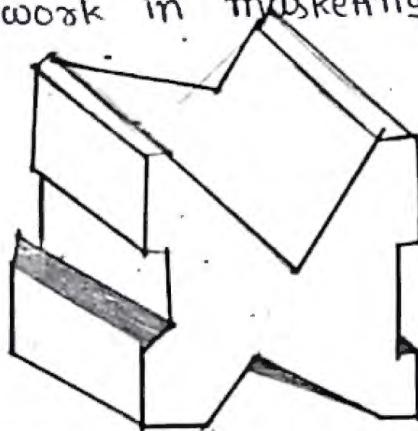


CENTRE-PUNCH

(b)

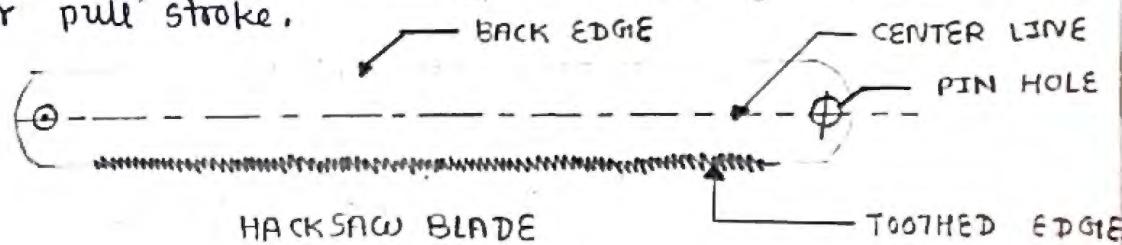
V-block :-

It is used in holding in the round bars, during marking and centre drilling their end faces. It provides useful support to work in marking.



(c) Hack saw blade :-

Hacksaw is a tool used for cutting desired lengths of rods, iron flats, bar stocks etc. It consists of a metal frame with a metal blade for cutting. The blade can be mounted with teeth facing towards or away from handle resulting in cutting action or either push or pull stroke.



Ans-3 Parameter to be considered for selection of a hacksaw blade :-

- (1) Tooth per inch (TPI) : The pitch of tooth ranges from 14 to 32 TPI. Lower TPI blade for cutting thick metals. High TPI blade for cutting thin materials.
- (2) material to be cut : It's dimension and form.

- Ans-4 To cut external thread we use Die.
- Ans-5 File is specified by its length.
- Ans-6 Try-square is used to check : both (a) and (b)
- Ans-7 for marking the lines on job we use: Scriber.
- Ans-8 A surface plate is a solid, flat plate used as the main horizontal references plane for precision inspection, marking out (layout) and tooling set up. Cast iron is used for marking surface plate.
- Ans-9 Hack saw blade is specified by its a, b & c
i.e. Length, width & pitch
- Ans-10 Reamer is used for finishing holes

EXP NO.: 5

DATE: 26/4/23

SMITHY PRACTICE

Objectives: Student should be able to:

1. Name different hand tools and equipments used.
2. Demonstrate proper use of various tools.
3. Select proper tool for particular application.

Introduction :

Smithy is to handle small jobs, which can be heated in an open fire, or hearth and various operations are performed by means of hand hammer or power hammers.

Forging refers to the production of those parts, which must be heated in a closed furnace. The various operations are performed by means of heavy hammers, forging machines and presses. Forging is always understood to be hot working, unless stated otherwise.

EQUIPMENTS & HAND TOOLS

HEARTH :-

It consists of fire gate made of mild steel or cast -iron bars. There is an inlet for blowing air either through the back or bottom. The air is blown through centrifugal blower, which runs through variable speed motor or constant speed motor. The fuel used in a hearth maybe coke, coal or charcoal. For general work steam coal is used.

ANVIL: -

The anvil from a support for black smith's work when hammering. It is made in several forms but two most common forms are :

- (1) English anvil: Single beak of horn
- (2) French anvil: Beak at each end.

The base of anvil is made of mild steel with tool steel face welded on the body. The round hole in the anvil called pritchet hole is used for bending rods of small diameters and as a die for hot punching operation. The beak is used for bending round sections to different diameters. The edge between the beak & the anvil face may be used for resting metal when cutting with a chisel. The soft underneath metal does not damage the chisel edge. The square or hair die hole is used for holding square shanks, swages and bottom chisel etc.

In addition to the above, following hand tools are used:

- | | |
|----------------|-----------------|
| 1) Hammer | 7) Flatters |
| 2) Tongs | 8) Set Hammer |
| 3) Swage block | 9) Punches |
| 4) Swages | 10) Drifts etc. |
| 5) Chisels | |
| 6) Fullers | |

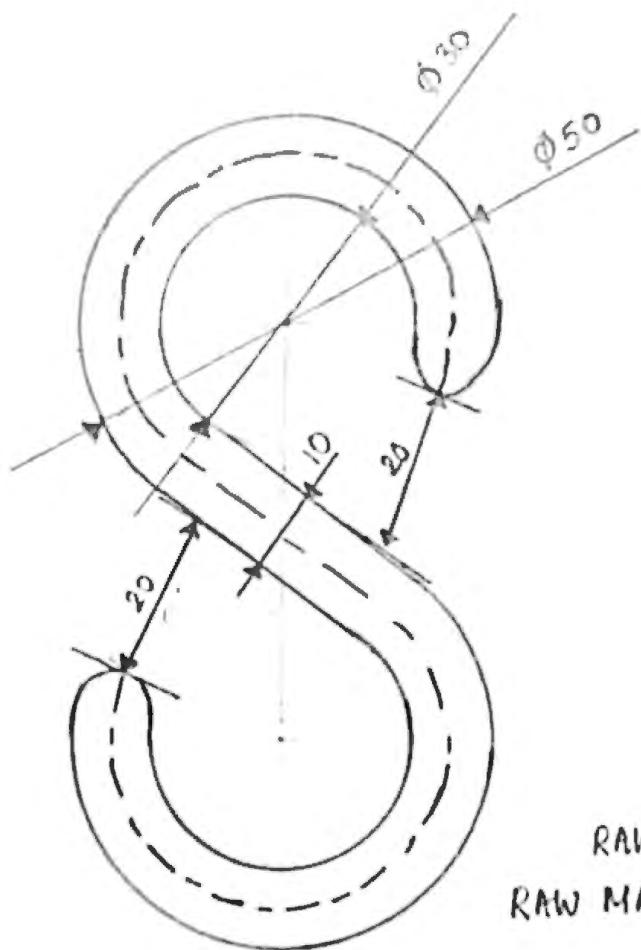
JOB SHEET

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EXERCISE

1. List different hand tools used for different smithy operations and explain any four with neat sketch in detail.
2. Explain up setting and flattening operation with neat sketch.
3. List various operations you have performed to prepare the job in smithy shop.
4. List various fuels used.
5. List the temperature measuring devices used in smithy.
6. List the applications of Hot & Cold Forging.

Ans-1 Hand tools used in smithy operations : Smith's forge, Anvil, Iwage block, hummers and sledge, Jongs, swages, fullers, flatters, chisels, punches & dafits.

(i) Hummers & Sledges :

Hummers & sledges are main striking tools for giving blows to the job in forging work. These are various types of hummers but Smith's hummers of 3 types :

- (i) Bull pane hummers
- (ii) Cross pane
- (iii) Straight pane hummers.

Then Sledge hummers are used for giving heavy blows to the jobs.

(ii) Chisels :

These are used to cut metals in hot or cold state. These are hot chisels & cold chisels. They are made of high carbon steel.

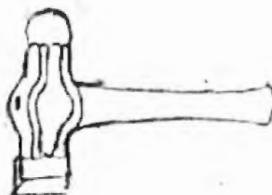
(iii) Fullers :

They are used for making necks by reducing the cross section of a job & in drawing out.

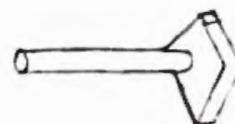
These are made of high carbon steel in different sizes.

(iv) flatters:

flatters are used for flattening, levelling of surface.
These are made of carbon steels.



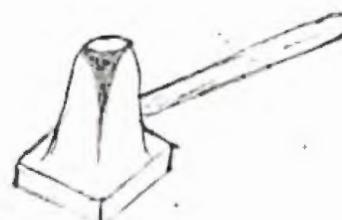
(i) BALL POINT HAMMER



(ii) CHISEL



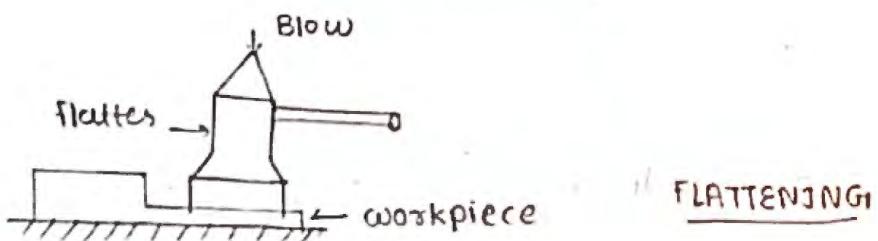
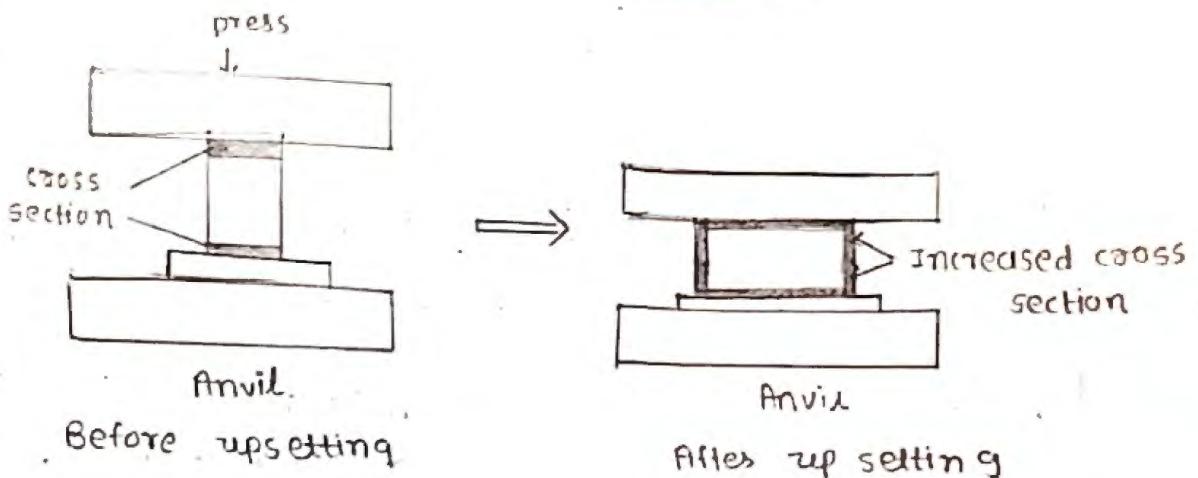
(iii) FULLERS



(iv) FLATTER

Ans - 2 Up setting: It is a process through which the cross-section of metal piece is increased with a corresponding reduction in length. When metal is sufficiently heated, so that it acquires plastic stage, it becomes soft. If some pressure is applied to it, the metal tends to increase in its dimensions, at right angle to direction of force with a corresponding reduction in its dimensions parallel to line of action of said force. The particular part in the bar shape where said increase in size is required, is heated till it acquires a fully plastic area.

→ Flattening: This process is carried out to reduce the thickness of job to required shape. The flattening is carried out after drawing out, flattening or any other operation to remove the flattening marks for leveling & finishing flat surface.



Ans-3 Various operations performed to prepare job in smithy job
use: Upsetting, drawing down, drawing out, setting down, punching, cutting, bending, drafting & finishing.

Ans-4 Various fuels used in this practical are solid fuels such as coal, coke, charcoal etc. liquid fuels such as different types of fuel oil & gaseous fuels like natural gas & producer gas.

Ans-5. Temperature measuring device in smithy operation use:
Liquid expansion thermometers, thermocouples, resistance, temperature detector, pyrometers, tungsten probe & infrared sensors.

Ans - 6 # Application of Hot forging:

- (a) Construction industries
- (b) mechanical engineering
- (c) Agriculture
- (d) Defense industry
- (e) Steel construction
- (f) offshore industry
- (g) Sanitary sector.
- (h) precision engineering & watchmaking industry.

Application of cold forging.

- (a) Automobile industries for manufacturing steel & Suspension parts.
- (b) Anticlock ~ braking system.
- (c) Bits
- (d) Pins
- (e) Step & Intermediate shafts.

CARPENTRY PRACTICE

Objective: Students should be able to:

1. Name different types of woods and their applications.
2. Sketch different types of joints used for wood working and their applications.
3. Select proper hand tools/machines for specific application.

Introduction:

Carpentry is a process that deals with timber, which is used, in construction work, furniture work, wooden toys, geometrical instruments, patterns etc. These processes make use of different types of woods viz. hardwood and soft wood.

1. Soft timber or soft wood e.g. pinewood, deodar etc.
2. Hard timber or hard wood e.g. teak, oak, mango, babul etc.

Timber is available in different forms:

- (1) Log : Trunk of a tree
- (2) Balks : Rough and square log
- (3) Posts : Square and round sectioned pieces ranging from 175 to 300 mm
- (4) Deals : Parallel side 225 mm wide & approx 100 mm thick.
- (5) Planks : Parallel side pieces 275 mm to 450 mm wide & approx. 75 mm to 100 mm thick & 2.5 to 6.5 mtr. long.
- (6) Batten : Rectangular pieces up to 175 mm wide & 35 to 50 mm thick.
- (7) Board : Swan pieces less than 35 mm thick & over 150 mm wide.

Seasoning:

It is necessary to remove moisture and sap from the fresh timber before using it in order to avoid shrinkage, cracking and warping during and after its usage. This process is termed as seasoning. Seasoning can be through a natural process or an artificial process.

Carpentry Process:

To give shape, size and finish to wooden articles a large number of operations are performed. The main operations are:

1. Marking, measuring and laying out
2. Sawing/cutting
3. Planning
4. Chiseling

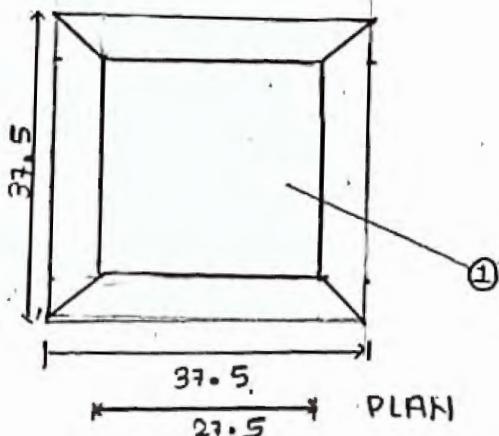
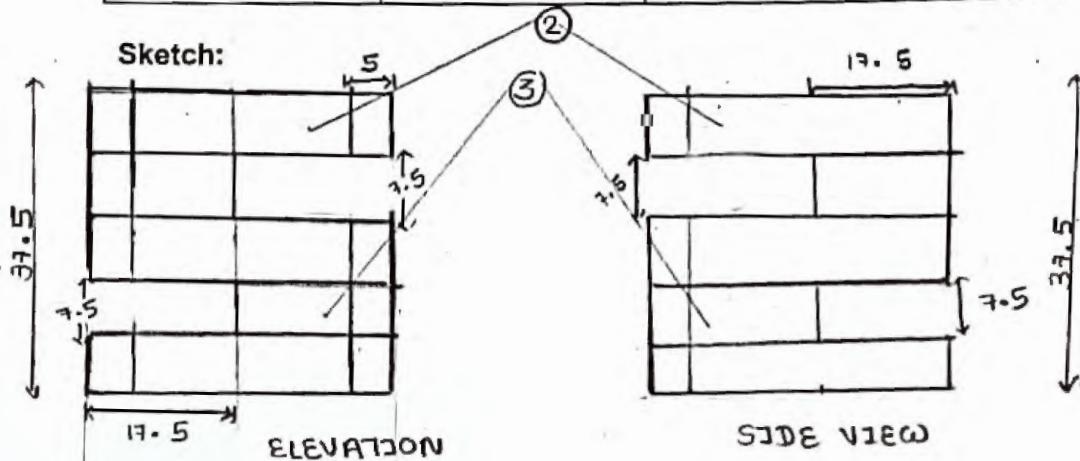
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Completion/ Submission			

Sketch:



$$\text{Ratio} \Rightarrow 3 : 2$$

→ Material = chil wood

- Material :
- 1) $55 \times 55 \times 10 \text{ mm} = 3 \text{ nos}$
 - 2) $15 \times 10 \times 75 \text{ mm} = 12 \text{ nos}$
 - 3) $15 \times 10 \times 35 \text{ mm} = 8 \text{ nos}$

All the dimensions are in
" mm".

Work Details:

Date	Time		Total Hrs.	Sign of Instructor	Remarks
	From	To			

EXERCISE

1. List the common defects found in timber and explain them in brief.
2. Explain the functions of the following wood working tools
 - a. Jack Plane b. Mallet c. Firmer Chisel d. Try Square
3. Give name of the tools used for the following operations
 - a. Pulling out a nail b. To produce small hole manually in wood
 - c. Marking parallel lines d. To produce square hole manually in wood
4. Sketch and describe following joints made in carpentry shop.
 - a. Tee lap joint
 - b. Bridle joint
5. What is "Seasoning" of timber? List the different processes used for the same.
6. Select any wooden product and list the following details:
 1. Name of the product
 2. Application
 3. Type of material used
 4. Operations to be performed to manufacture the product.
 5. Tools used for the same.

Ans-1 The common defects in timbers are :

- (i) Natural defects
- (ii) Processing defects
- (iii) Weathers defects / Environmental defects.

(i)

Natural defects :

These are developed in a tree during its growth. Their development, therefore cannot be controlled by man. Most common natural defects are : knots, shakes, burs, cross grain, crookedness, and galls, etc.

(iii) processing defects :

- chip mark : Indicated by marks or signs placed by chip on the finished surface of timbers.
- Diagonal grain : It is formed due to improper sawing of timbers .
- Torn grain : Defects is caused when a small depression is formed on the finished surface of timbers by falling of a tool or so.

(iii) Weathers / Environmental defects :

Woodworkers are quite familiar with these defects - knots, splits, ugly dark streaks or stains, worm holes, every decay. Some of the more common wood defects all woodworkers face include: Bark pockets formed when a small piece of the bark protrudes into the timbers. This area is generally considered unsound.

NS - 2
(a) Jack plane : A jack plane is a general purpose wood-working bench plane, used for dressing. Timbers down to size in preparation for truing and edge jointing. The versatility of the jack plane has led to it being the most common bench plane in use. The name jack plane is sometimes used interchangeably with longe fore plane.

(b) mallet : A mallet is a kind of hammer, often made of rubber or sometimes wood, that is smaller than a maul or beetle; and usually used in carpentry to knock wooden pieces together, or to drive dowels or chisels.

(c) Firmer chisel: firmer chisel has a blade with a rectangular cross section, making them stronger for use on through and heavier work. Bevel edge chisel ---, Dovetail chisel - made specifically for cutting dovetail joints.

(d) Try square: A try square or try-square is a wood working tool used for marking and checking 90° angles on pieces of wood. The square in the name refers to the 90° angle. To try a piece of wood is to check to check if the edges and faces are straight, flat and square to one another.

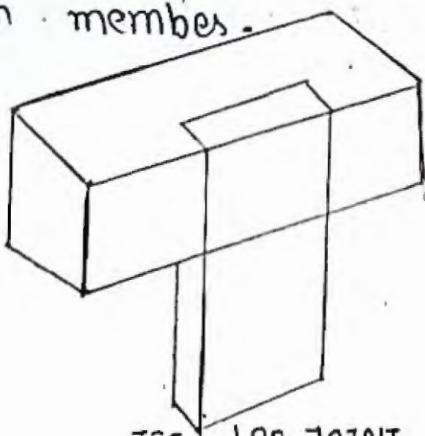
Ans-3

- (a) claw hammer.
(c) masking gauge
- (b) wheel brace, Ratchet brace.
(d) Router.

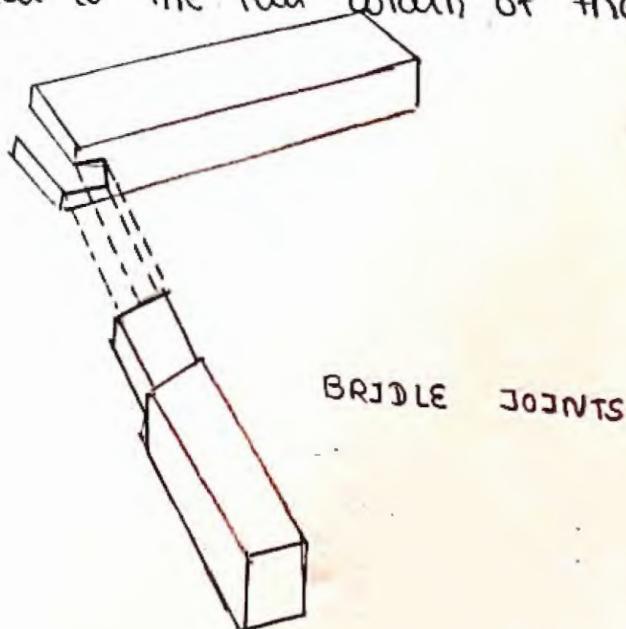
Ans-4

(a) Tee lap joint: A tee lap joint or overlap joint is a joint in which the members overlap. Lap joints can be used to join wood. Lap joints can be used in woodworking for joining wood together. Most commonly in half lap joints, the members are of the same thickness and half the thickness of each is removed.

(b) Bridle joints: A bridle joints is a woodworking joint, similar to a mortise and tenon, in that a tenon is cut on the end of one member and a mortise is cut into the other to accept it. The distinguishing feature is that the tenon and the mortise are cut to the full width of the tenon member.



TEE LAP JOINT
Mechanical Engineering Department, SVIT



BRIDLE JOINTS

Ans - 5

Seasoning is the process of drying timbers to remove the bound moisture contained in walls of the wood cells to produce seasoned timbers. Seasoning can be achieved in a number of ways, but the aim is to remove water at a uniform rate through the piece to prevent damage to the wood during drying.

These are two major ways of seasoning timbers.

(i) natural drying

(ii) artificial drying

and others are (iii) chemical drying

(iv) solar drying.

Ans - 6

(1) pen stand

(2) To keep pendal pencils, pen etc.

(3) chil wood / soft wood.

(4) operation to be performed to manufacture the product:

(i) masking (iv) Binding & assembly

(ii) sawing (v) Sanding

(iii) planning (vi) Polishing & Finishing.

(5) Tools used for the same:

Carpentry vice, try square, masking gauge, steel rule, chisel, wood planes, sanding machine, wood adhesives, saw etc.

EXP NO: 7

DATE: 19/5/21

SHEET METAL PRACTICE

Objective: Students should be able to:

1. Name different hand tools, work holding tools used and their applications for sheet metal work.
2. Name different sheet metal materials and their applications.
3. Demonstrate proper use of various hand tools.

Introduction:

Sheet metal work is an operation used for producing varied household and engineering goods from metallic sheets where other methods are not viable or too complicated. The term sheet metal implies metal and alloys rolled to thickness ranging from 10 SWG and thinner sheets. Plate metal work has its own importance in manufacturing industries and plays an essential role in various aspects of our day-to-day needs. Application of sheet metal articles is in agriculture, building construction, household, offices, laboratories, shop equipment, heating and air conditioning, transportation, decorative articles, toys and many more. Knowledge of geometry and development of surfaces is very important for manufacturing of sheet metal products. While calculating total material requirements various process allowances and properties of metal under use should be considered.

Standard gauge numbers specifies sheet thickness; each gauge designates a definite thickness. The larger the gauge number, the lesser is the thickness.

TYPE OF SHEETS

They could be divided in two main groups.

(1) Steel (ferrous) sheets:
(a) Mild steel sheets
(b) Stainless steel
(c) Galvanized sheets
(d) Tin sheets

(2) Non Ferrous sheets:
(a) Copper sheets
(b) Lead sheets
(c) Zinc sheets
(d) Brass sheets
(e) Aluminum sheets.

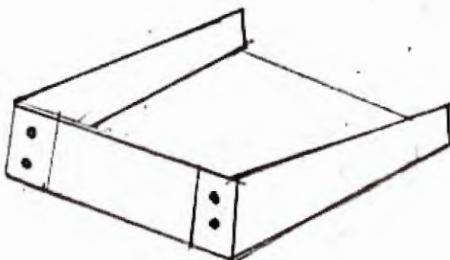
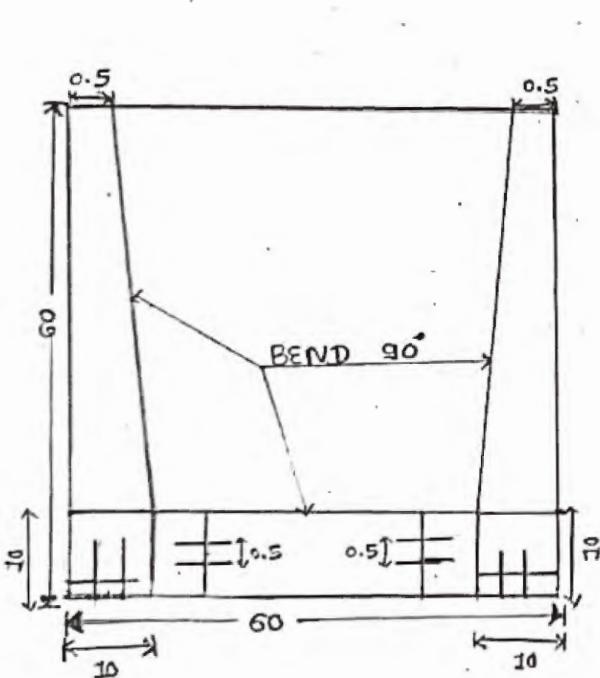
JOB SHEET

EXP. NO.

NAME OF THE SHOP:

	Date	Sign of Teacher	Grade
Start			
Completion/ Submission			

Sketch:



RATIO $\Rightarrow 1:4$
 RAW MATERIAL = $0.57H \times 245 \times 245$
 (G.I.)

ALL THE DIMENSIONS ARE IN
 'mm'.

Work Details:

Date	Time		Total Hrs.	Sign of Instructor	Remarks
	From	To			

Ans - 1 Hand tools used in sheet metal job :

- masking tools : steel rules , square , scribes , punches , dividers , Tammel points etc.
- cutting tools : Snips , chisel , hammers , pilers , stakes operations #

(ii) Shearing : It is a general name for sheet metal cutting. Some operations are :

- (a) cutting, (b) punching, (c) lancing, (d) parting, (e) notching
- (f) Trimming (g) Blanking (h) setting etc.

(iii) Bending : (a) angle, (b) curling, (c) forming.

(iv) Squeezing : (a) coining, (b) Embossing, (c) flattening.

(v) Drawing : It's an operation of producing cup-shaped object from flat sheet metal blanks by bending of metal with the help of punch and die or by pinning metals.

Ans - 3. The instrument used for measuring thickness of sheet are : Standard gauge numbers specifies thickness of sheet , each gauge designates a definite thickness. The larger gauge numbers , the larger the thickness . so gauge is used to measure thickness of metals sheet.

Ans - 4 Some examples of sheet metal articles used in industry / home : air conditioners , toys , decorative articles etc.

Ans-5. Different type of rivets are :

- (1) Round head
- (2) pan head
- (3) flat head

(1) Round head : These are most commonly used rivets and feature a dome shape head and a flat bearing surface. They are used in things which required very low resistance to vibration and moments. The flat surface is used to provide a straight cut off improved alignment in any structure.

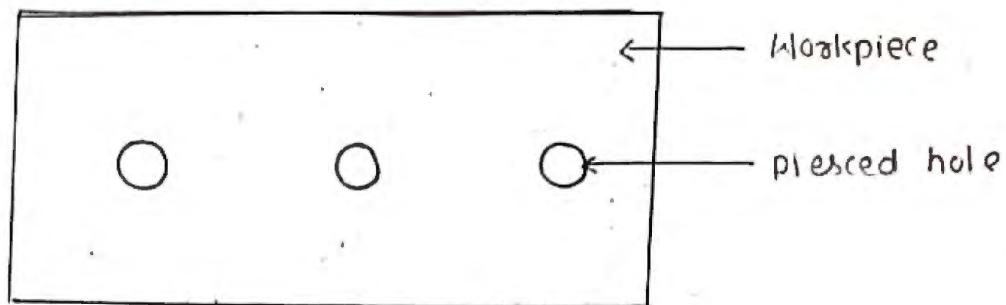
(2) Pan head : These are slightly rounded with short vertical sides. It is used in wire forming, bending, straightening, cutting, drilling, tapping, trimming and piercing. These are made from wide variety of materials brass, cooper, aluminium, low carbon steel stainless steels.

(3) Flat head : These rivets are used in sheet metals. flat head types have flat surface that tapers toward the screw body to allow for countersinking. The flat head lies flush against the workpiece. This is used in countersinks holes & one set. They are used in the trucks where head will not protrude into the sliding trucks or rollers. The rivet is almost inverted, with a 120° countersink in the integrated washers.

Ans - 2

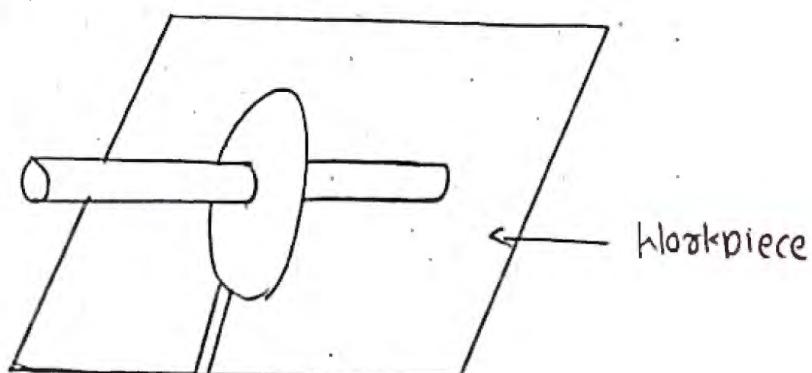
(i)

Piercing : It is a shearing process in which the material is pierced with a tool, resulting in the creation of a circular or other shape hole.

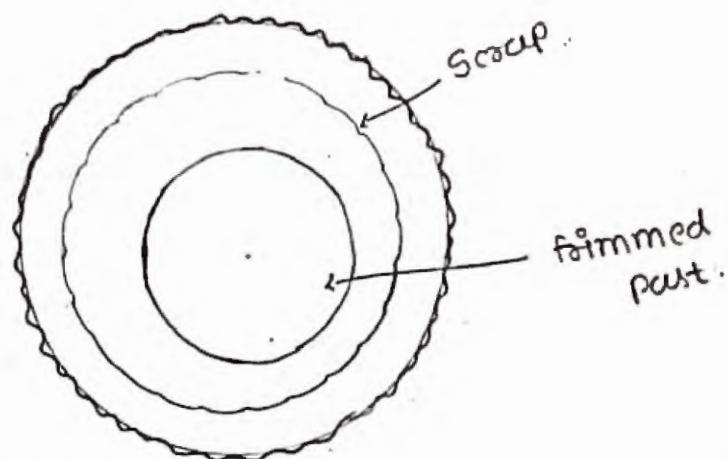


(ii)

Slitting : It is a sheet metal cutting process with circular knives, which is used to split wide coiled sheet metal into narrower widths or for edges trimming of rolled sheet.



(iii) Trimming: It is a manufacturing process that is used as a finishing operation for forged parts in order to remove flash. Flash is excess or undesired metal in a workpiece that is trimmed away while finishing.



[Punching away excess material from the perimeters of a workpiece]

DATE: 80/5/21

EXP NO: 8

PLUMBING PRACTICE

Objective: Students should be able to:

1. List various hand tools, accessories used & their applications.
2. Name different types of pipes-fittings, their specifications, materials & application.

Introduction:

The Oxford Directory defines a plumber as an artisan who fits and repair pipes, cisterns, etc. using lead, copper or tin. The word plumber is derived from the Latin word *plumbum*, meaning *lead*. The plumber is an artisan who works with lead.

Plumbing is concerned to join and repair of pipes that carry fluids and gases. A craftsman may be perfectly proficient with hammer, saw & other tools but faces difficulties with leaking of pipes & over flowing toilets. Many people rush to plumber at the first sight for dripping pipe, but a person with a little knowledge of sanitary system can control this problem & save time & money. In an industry, plumbing system can be divided into the following three categories.

- (1) The supply system where the water comes from
- (2) The fixture where the water is used
- (3) The drainage disposal of wastewater.

Plumbing tools

A proficient plumber must be thoroughly conversant with his tools. The main tools used in plumbing are:

- | | |
|---------------------------|-------------|
| (1) Workbench | (2) Vice |
| (3) Wrench | (4) Plier |
| (5) Threading dies & taps | (6) Hacksaw |

Workbench: A workbench used in plumbing is nearly 90 x 75 cm in dimension with a pipe vice fitted over it.

Pipe vice: A plumbing vice has serrated jaws to grip the pipe & prevent it from turning. In selecting a plumber vice it is important to consider how securely the pipe is held in the vice & whether it is suitable to hold all sizes of pipes.

Different type of plumber vices used in plumbing are: (a) Yoke vice (b) Combination vice (c) Chain vice .

Introduction:

Mechanical Engineering Department, SVIT

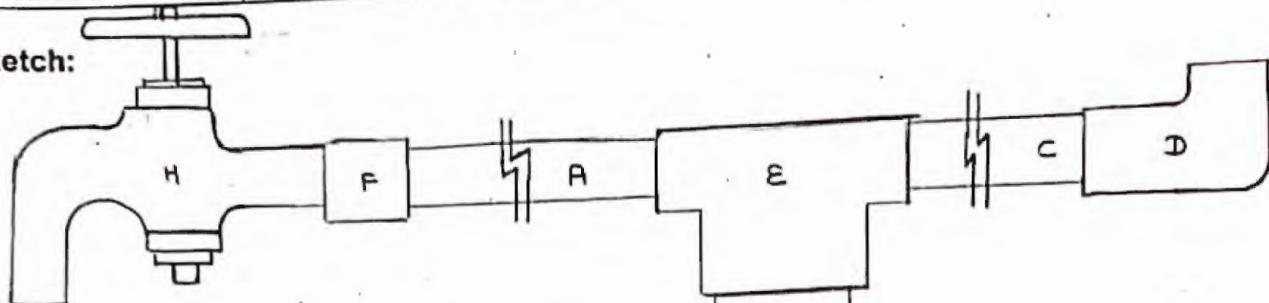
JOB SHEET

EXP. NO.

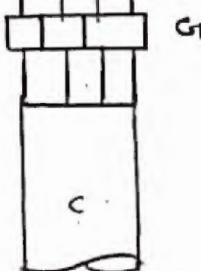
NAME OF THE SHOP:

	Date	Sign of Teacher	Grade
Start			
Completion/ Submission			

Sketch:



A	3/2" PIPE 240 mm LONG
B	3/2" PIPE 220 mm LONG
C	3/2" PIPE 120 mm LONG
D	ELBOW
E	TEE
F	COUPLING
G	UNION
H	COCK



RAW MATERIAL :

3/2" G I PIPE

FITTING

Work Details:

Date	Time		Total Hrs.	Sign of Instructor	Remarks
	From	To			

EXERCISE

1. Which material is used for the pipes used in supplying water for household applications.
2. According to Indian Standards, pipes are specified by their:
a. Outside Diameter b. Nominal bore c. Wall thickness
3. A pipesetting used to branch off pipe at right angle from the supply line is called a:
a. tee b. bend c. cross d. union
4. Which of the following joint is commonly used for pipes carrying water at low pressure?
a. Union joint b. coupler joint c. socket joint
5. Describe the following pipe fittings with neat sketch:
a. Equal tee b. 90° elbow c. reducer d. cross
6. Name the hand tools you have used for the practical.
7. Name different materials used for pipes with related application.

Ans-1 Material used for various pipes that are used in household applications, are given below.

(i) PEX Pipes :

Cross-linked polyethylene.

(ii) PVC Pipes :

Made up of polyvinyl chloride.

(iii) ABS pipes :

Acrylonitrile Butadiene styrene.

(iv) Copper pipe :

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(v) Galvanized pipes :

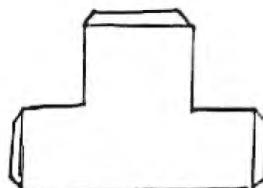
These are the steel pipes that have been dipped in a protective size coating to prevent corrosion and rust.

Ans - 2 (b) Nominal bore

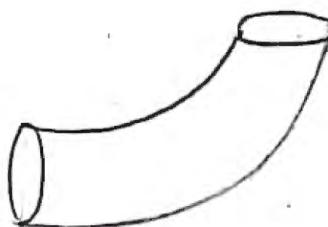
Ans - 3 (A) Tee

Ans - 4 (c) Socket joint

Ans - 5 (a) Equal Tee : An equal tee is used as the branch of a main pipe with same diameters.



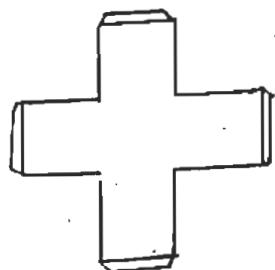
(b) 90° elbow : It is a fitting which is in such a way to produce a change in the direction of flow in pipe. It is used to change the direction in piping and is also sometimes called "quasi bend".



(c) Reducer : A Reducer is a kind of pipe fitting that reduces the pipe size from a larger Bore to a smaller bore.



(iv) Cross: A pipe cross is a kind of pipe fitting which is used where two pipes meet together.



Ans-6 Hand tools used in the given practical are given below:

- | | | |
|---------------|-----------------------|-------------------------------|
| (a) Wrenches | (d) plies | (g) Taps |
| (b) pipe vice | (e) Spanners | (h) pipe Bending
Machines, |
| (c) Hacksaw | (f) Threading
dies | |

Ans-7 (i) Material used for drinking water supply:

- Galvanized steel or iron
- copper
- polybutyline
- PVC
- CPVC
- PE.

(ii) Materials used for waste lines :

cast iron

chromed copper

chromed brass

(iii) Material used for gas pipe lines :

Black iron.

DATE: 26/5/21

EXP. NO. 9

WELDING AND SOLDERING PRACTICE

Objectives: Student should be able to:

1. Name different hand tools and equipment used for welding and soldering practice.
2. List various welding processes and their application.
3. List different safety measures to be observed during the process.
4. Name different soldering filler materials used and different joining methods used.
5. List advantages and disadvantages of soldering process.

WELDING (perminual)

Introduction:

Welding may be defined as the process of joining similar and dissimilar metals by the application of heat with or without application of pressure and filler metal, in such a way that the result is continuity of homogenous material. The welded component results in continuity of a homogeneous material having the same compositions and characteristics as single piece.

Classification of Welding Processes:

Welding process can be classified:

1. Based on source of heat.
2. Based on application of pressure.

Weldability of Metals:

The term "weldability" has been defined as the capacity of material being welded into inseparable joints having specified properties such as definite weld strength, proper structure, etc.

Advantages of Welding process:

1. It produces a permanent joint.
2. The overall cost of welding equipment is generally low.
3. Many portable welding instruments are availed.
4. A large number of metals can be welded.
5. A good weld is as strong as the base metal.

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JOB SHEET

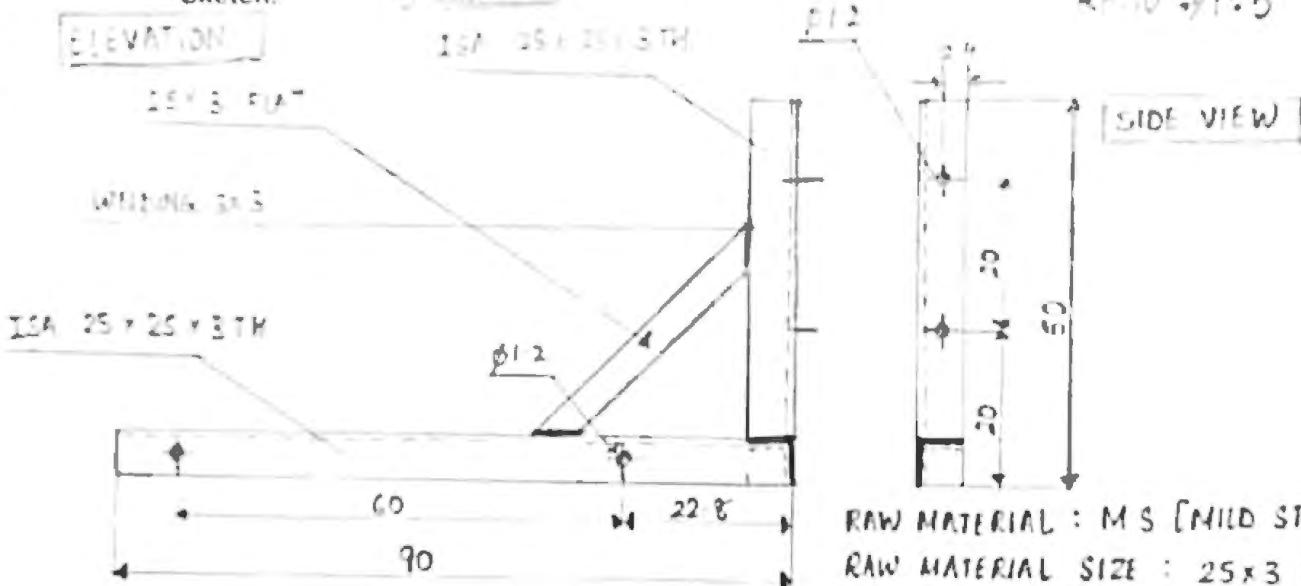
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Sketch:

卷之三

5850 91:5



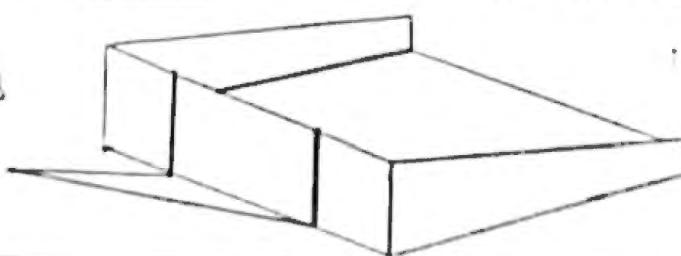
RAW MATERIAL : MS [MILD STEEL]
RAW MATERIAL SIZE : 25x3 FLAT

25 x 25 x 3TH ANGEL

2) SOLDERING

ALL DIMENSIONS ARE IN mm

RAW MATERIAL:
SHEET METAL JOB



Work Details:

Mechanical Engineering Department, SVIT

Ans - 1 Welding process can be classified as,

- (i) Based on source of heat
- (ii) Based on application of pressure.
- (iii) There are different type of welding.
 - (a) Arc welding
 - (b) Gas welding
 - (c) Resistance welding
 - (d) Solid state welding
 - (e) Nuclear welding.

Arc welding :-

- It is a type of welding process using an electric arc to create heat melt and join metals.
- A power supply creates an electric arc between a consumable or non-consumable electrode and the base material using either direct or alternating current.
- It is done for heavy metals which needs more heat to melt.

Ans-2

The metal use electrodes may be grouped and classified as thinly coated electrodes and shielded use or heavy coated electrodes. The covered electrode is the most popular type of filler metal used in use welding. The type of electrode used depends on specific properties required in the weld deposited.

Ans-3

Applications of soldering use :

- (i) Electrical components in radio, TV, tape recorder and transistors.
- (ii) Electrical circuit like painted circuit board.
- (iii) Cycle work soldering of brake pads with knobs.
- (iv) Used for joining wires and small parts.
- (v) Sometime used for repairing utensils.

Ans-4

- (i) Thoroughly cleaning off the surface to be joined.
- (ii) Clamp parts with appropriate gap.
- (iii) Soldering iron tip should not be burnt.
- (iv) After completion of soldering work, wash the joint and inspect it.

• Various instruments used are :

- (a) Blow torch
- (b) Filler material
- (c) Flux material
- (d) Soldering iron.

Ans - 5

	Melding	Soldering
(a)	Tempretuse of $> 450^{\circ}\text{C}$ lower or equal to melting temp. of the material.	Tempretuse $< 450^{\circ}\text{C}$
(b)	Plasma, electric arc, electrical resistance and uses arc fuel source.	Soldering iron, ultra sound, electrical resistance and even arc heat sources.
(c)	Use of flux is optional.	Use of flux is mandatory.
(d)	High presses in joints & strength of joint is also high.	Low presses in joints & strength of joint is also low.
(e)	It requires high power & tempretuse.	It requires low power & tempretuse.

MACHINE SHOP

Objective: Students should be able to:

1. List various machine tools & their applications available in the workshop.
2. Select proper machine for particular application and process.
3. Overall idea about various operations can be performed on lathe Machine and drilling machine.

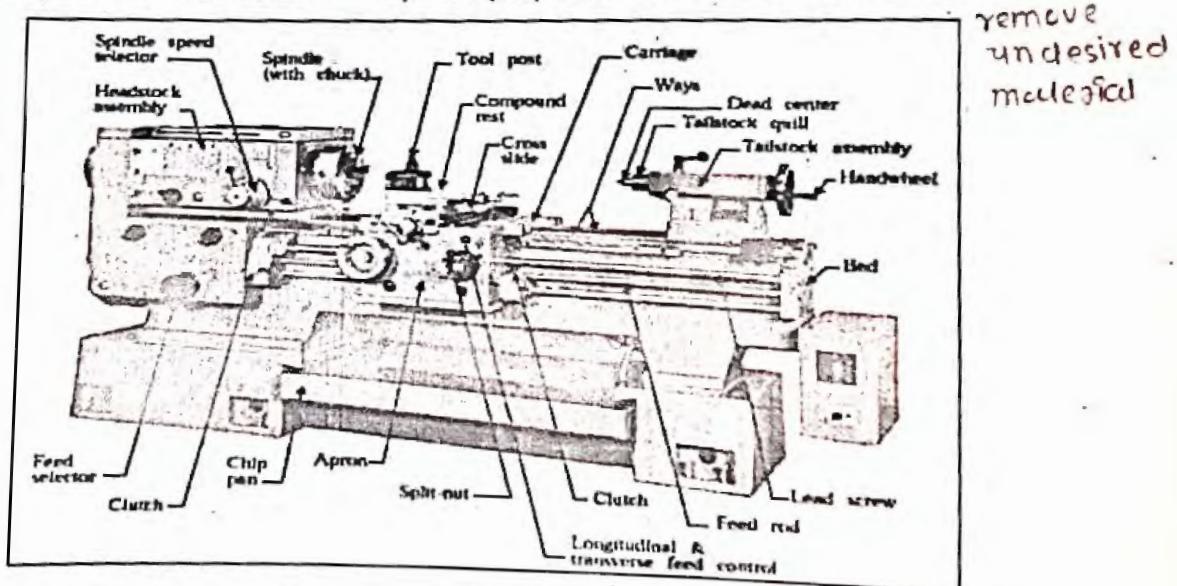
Introduction:

Metal cutting processes are performed on metal cutting machines, more commonly termed as Machine Tools by means of various types of cutting tools. A machine tool is a power driven metal cutting machine, which produce desired shape and size of work piece from raw material.

Lathe Machine:

The lathe is a machine used to remove metal from a work piece to give it required shape and size. The work piece or job is held securely by appropriate device on lathe and cutting tool is fed against the rotating job to remove material in form of chips. Depending upon the field of specific application, there are various types of lathe available, some of them are as listed below.

- Speed lathe - Engine lathe - Tool room lathe - Bench lathe
- Capstan and Turret lathe - Special purpose lathe - Automatic lathe



Horizontal Lathe Machine

Power tools

A power tool is a tool that is actuated by an additional power source and mechanism other than the solely manual labor used with hand tools. The most common types of power tools use electric motors. Internal combustion engines and compressed air are also commonly used. Other power sources include steam engines, direct burning of fuels and propellants, such as in powder-actuated tools, or even natural power sources such as wind or moving water.

Power tools are used in industry, in construction, in the garden, for housework tasks such as cooking, cleaning, and around the house for purposes of driving (fasteners), drilling, cutting, shaping, sanding, grinding, routing, polishing, painting, heating and more.

Power tools are classified as either stationary or portable, where portable means hand-held. Portable power tools have obvious advantages in mobility. Stationary power tools, however, often have advantages in speed and precision

EXERCISE

1. List various operations performed on a Lathe machine.
2. List various operations performed on a drilling machine.
3. List different power tools available in workshop.

- Ans 1. The most common lathe operations are turning, burning, grooving, parting, threading, drilling, boaring, knurling, cupping.
- (i) plain turning : One of the fundamental uses of a lathes is the turning between centres. It is done to remove excess material from the work piece to produce a cylindrical surface.
- (ii) taper turning : It means to produce a conical surface, a gradual reduction in diameter from a cylindrical workpiece.

- (iii) Step turning: It creates two surfaces with an abrupt change in diameter between them. The final feature resembles step.
- (iv) Facing: It is a operation of machining the ends of a piece of work to produce a flat surface square with the axis. A segulus turning tools is used for facing.
- (v) Grooving: In this operation the diameters of the workpiece over a very narrow surface is reduced.
- (vi) Parting: Components maybe parted off or cut-off from the bar with a parting tools. This must be very keen, set at the centre height and fed evenly.
- (vii) Boring: The boring of holes when jobs are in the chuck should be done with the stoutest boring tool.
- (viii) Drilling: It removes the material from inside of workpiece.
- (ix) Knurling: It is the process of embossing a diamond shaped pattern on the surface of a workpiece to provide an effective gripping surface on a workpiece.
- (x) Threading: In this operation, excess material is removed from the workpiece to make its diameter equal to the major diameter of the screw thread.

Ans-2 Drilling machine operation:

Besides the production of circular holes by means of drills, various other operations can be done on a drilling machine.

- (i) Reaming: Reaming is the sizing & finishing of a hole by means of a tool called a reamer, having several cutting edges. A reamed hole is smoother, straighter & more accurate than drilled hole.
- (ii) Busing: Busing is the operation of enlarging a hole by means of an adjustable cutting tool with one cutting edge.
- (iii) Spot busing: It is the smoothing and squaring of the surface around the hole end, as for the seat for a nut or the head of a screw.
- (iv) Tapping: Tapping is the forming of internal screw threads by means of a tool called a tap.

Ans-3 Power tools in workshop use:

- | | |
|--------------------|----------------------|
| (1) Air compressor | (9) Hammer drill |
| (2) Angle grinders | (10) Heat gun |
| (3) Bandsaw | (11) Impact wrench |
| (4) Biscuit joiner | (12) Jointer |
| (5) chain saw | (13) Jigsaw |
| (6) Circular saw | (14) Mitre saw |
| (7) Disc sander | (15) Nail gun |
| (8) Drills | (16) Orbital sander. |

- (18) Oscillating tool
- (19) Planes
- (20) Power screwdrivers
- (21) Radical arm saw
- (22) Reciprocating saw
- (23) Rotatory tool.
- (24) Routes
- (25) Scroll saw
- (26) Shop vacuum
- (27) Table saw
- (28) Wall chases
- (29) Lathe
- (30) Side grinders.

DATE: 17/6/21

EXP. NO. 11

PLASTIC MOULDING & GLASS CUTTING

Objective: Students should be able to:

1. Name different types of plastics and their applications.
2. Write the different types of uses of plastic other than mentioned in practical and their applications.
3. Name different types of glass and their applications in daily uses.

Introduction:

Plastics are a wide range of synthetic or semi-synthetic organic compounds that are malleable and so can be molded into solid objects. Plastics are typically organic polymers of high molecular mass and often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, however, an array of variants are made from renewable materials such as polylactic acid from corn or cellulosics from cotton linters.

Different types of plastics are available in the market as follow:

Polyamides (PA) or (nylons) – fibers, toothbrush bristles, tubing, fishing line and low-strength machine parts such as engine parts or gun frames

Polycarbonate (PC) – compact discs, eyeglasses, riot shields, security windows, traffic lights and lenses

Polyester (PES) – fibers and textiles

Polyethylene (PE) – a wide range of inexpensive uses including supermarket bags and plastic bottles

➢ **High-density polyethylene (HDPE)** – detergent bottles, milk jugs and moulded plastic cases

➢ **Low-density polyethylene (LDPE)** – outdoor furniture, siding, floor tiles, shower curtains and clamshell packaging

➢ **Polyethylene terephthalate (PET)** – carbonated drinks bottles, peanut butter jars, plastic film and microwavable packaging

Types of plastic moulding processes:

To give shape, size and finish to the plastic articles various moulding processes are used. The main processes are:

- (1) Injection Moulding
- (2) Extrusion Moulding
- (3) Compression Moulding
- (4) Blow Moulding
- (5) Rotational Moulding and many others.....

- Ans - 3
- Milk bottles, shampoo bottles - (High density polyethylene)
 - Outdoor furniture, floor tiles, cassies bags -
(Low density polyethylene)
 - Water pipes - (polyvinyl chloride)
 - Eyeglasses, traffic lights, lenses etc - (polycarbonate)
 - Carbonated drink bottles, peanut butter jars, plastic film -
(polyethylene terephthalate)

Ans - 4

Dumping of plastics on land or landfilling plastic leads to abiotic & biotic degradation of the plastic, where plastic additives can leach & eventually percolate into various aspects of environment, thereby causing soil & water contamination. Moreover, plastic takes thousands of years to decompose.

Ans - 5

Polycarbonate

Ans - 6

Glass consist of three main components.

- (i) Sand (SiO_2)
- (ii) limestone ($CaCO_3$)
- (iii) Sodium carbonate (Na_2CO_3)

- Steps for manufacturing a glass are as follows:
- (i) Batching of raw material in furnace.
 - (ii) Melting of raw material in furnace.
 - (iii) Drawing the molten glass onto the tin bath

- (iv) Cooling molten glass in unheating.
- (v) Quality check, automatic cutting, storage.

Ans. 5 Properties :

- (1) Transparency
- (2) Heat resistance
- (3) Pressure resistance
- (4) Breakage resistance
- (5) Chemical resistance.

Date: 16/6/21

Exp. No: 12

CASTING PRACTICE

Objectives: Students should be able to:

1. To learn about various pattern and types of material used in sand casting.
2. To prepare a sand mould from the prepared pattern for casting a iron block
3. To melt and pour iron metal into the mould.

INTRODUCTION:

Casting process is one of the earliest metal shaping techniques known to human being. It means poring molten metal into refractory mould cavity and allows it to solidify. The solidified object is taken out from the mould either by breaking or taking the mould apart. The solidified object is called casting and the technique followed in method is known as casting process.

Any casting process involves three basic steps: i.e. mould making, melting and pouring of metals into the mould cavity and removal of finishing of casting after complete solidification.

Casting:

The molten metal poured into mould, on cooling is known as casting.

Forgability:

The capacity of a metal to get forged is called forgability.

Foundry:

The place where jobs are prepared by melting and pouring the molten metal into the moulds is known as foundry.

Mould:

A mould is cavity so prepared that can be used to make casting by pouring molten metal into it.

PATTERN:

In casting, a pattern is a replica of the object to be cast, used to prepare the cavity into which molten material will be poured during the casting process.

Size of Pattern:

A pattern is always made larger than the required size of the casting in order to allow for various factors such as a. shrinkage b. Machining c. Draft e. Shake f. Distortion and g. Mould-wall movement.

Actual casting size + shrinkage allowance + shake allowance + finish allowance.

Ans-1 Green sand casting is an efficient moulding process that utilizes sand as main moulding materials.

- This casting method is referred to be 'green' since the sand is recyclable & there are no chemical additives in the sand, just clay, water and sand.
- The moisture content within the molds provides the binding structure of sand.

Ans-2 Pattern:

- The first step in making a casting is to prepare a model, known as a pattern, which differs in a no. of ways, respects from the resulting casting.
- It is the replica of the object to be cast.
- Thus, it can be defined as a model around which sand is packed to give size to a cavity called mold cavity.
- Materials generally used for patterns are: wood, metal or plastic.

• Mould:

- A mould is a cavity or void made in a compact sand mass, which when filled with molten metals, will produce a casting of the desired shape.

Ans-3 Use of sand mixtures:

- It is used for mixing sand & binders by a kneading & squeezing action for use in sand mixture is used for small scale production.

Ans-4 List of pattern materials :

- (i) wood
- (ii) metals & alloys
- (iii) plastics
- (iv) plastic
- (v) Wax
- (vi) Resins

Ans-5 Steps followed are :

- (i) Mould making
- (ii) Pouring
- (iii) Solidification & cooling
- (iv) Removal of sand mould
- (v) Finished casting
- (vi) cleaning & inspection.

ESTIMATION AND COSTING

Objective: Students should:

1. Get awareness of the importance of estimation and costing in engineering.
2. Estimate the cost price of the given product.

Introduction:

Definition of Estimating:

It is an art of finding the cost, which is likely to be incurred on the manufacture of an article, before it is actually manufactured.

Importance of Estimating:

In all organizations, before starting actual production or filling up the tenders, estimation is done. Therefore, accurate estimation is very necessary to compete in the market and to be sure whether manufacture of a particular article will be profitable or not. Both over and under estimation are dangerous.

Aims of Estimating:

The main aims are as under:

1. To help the factory owner in deciding the manufacturing and selling policies.
2. To help in filling up the tender enquiries.
3. To decide about the amount of overheads.
4. To decide about the wage rate of the workers after making the "time study".
5. It helps to decide whether a particular material should be purchased from the market or to be manufactured.

Elements of Estimation:

- | | |
|---|---------------------|
| 1. Design cost | 6. Drafting cost |
| 2. Drafting cost | 7. Material cost. |
| 3. Time and motion studies, Planning and Production control cost. | 8. Labour cost. |
| 4. Cost of design and arrangement of special items. | 9. Time allowances. |
| 5. Cost of experimental work. | 10. Overheads. |

Definition of Costing:

1. The technique and process of ascertaining costs.
2. It is the determination of an actual cost of an article, after adding different expenses incurred in various departments.

It differs from estimating that costing is a determination of cost after knowing the expenditure incurred on the product, while estimating is the pre-determination of cost based on the assumptions and experiences.

EXERCISE

1. Perform cost estimation of the given product.

Mechanical Engineering Department, SVIT

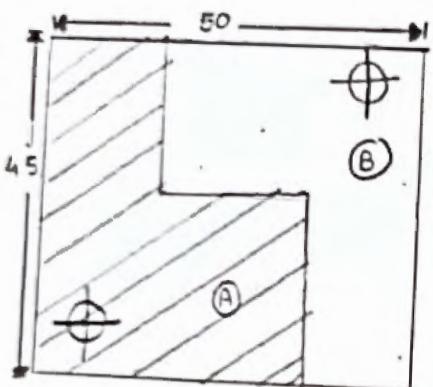
JOB SHEET

NAME OF THE SHOP:

EXP. NO.

	Date	Sign of Teacher	Grade
Start			
Completion/ Submission			

Sketch:



MATERIAL - MILD STEEL

SIZE = $6 \times 48 \times 48$

ALL DIMENSIONS ARE
IN MM.

Work Details:

Date	Time		Total Hrs.	Sign of Instructor	Remarks
	From	To			

Material size : $6 \times 3.8 \times 50$ mm
Density of material : 1.6 g/cm^3

Step - 1 :

$$\begin{aligned}\text{mass} &= \text{Volume} \times \text{density} \\ &= 0.6 \times 3.8 \times 5 \times 1.6 \\ &= 88.92 \text{ g} \\ &= 0.08892 \text{ kg}\end{aligned}$$

Step - 2 :

$$\begin{aligned}\text{Total mass} &= n \times m \\ &= 2 \times 0.08892 \\ &= 0.1778 \text{ kg}\end{aligned}$$

Material cost = 40 per kg

Step - 3 :

$$\begin{aligned}\text{Material cost} &= \text{Total mass} \times \text{cost per kg} \\ &= 0.1778 \times 40 \\ &= 7.1136 \text{ RS.}\end{aligned}$$

Daily charge of labours = ₹ 250
for 8 hrs.

Step - 4 :

Calculate labours cost

Hours	RS .
8	250
4	? = ₹ 125

Step - 5 :

$$\begin{aligned}\text{Additional cost} &= 10\% \text{ of labours cost} \\ &= ₹ 12.5\end{aligned}$$

• Step - 6 :

Overhead cost

$$\begin{aligned}&= 30\% \text{ of } [\text{labour cost} + \text{Additional cost} + \text{material cost}] \\&= 0.30 [125 + 12.5 + 7.1136] \\&= ₹ 14.46\end{aligned}$$

• Step - 7 :

Summation of all cost

$$\begin{aligned}&\text{labour cost} + \text{material cost} + \text{Additional cost} + \\&\quad \text{overhead cost} + \text{Packing cost} \\&125 + 7.1136 + 12.5 + 14.46 + 1 \\&= ₹ 160.0736\end{aligned}$$

• Step - 8 :

Profit = 20% of total manufacture cost

$$\begin{aligned}&= 0.2 [160.0736] \\&= ₹ 32.88\end{aligned}$$

• Step - 9 :

Selling price

$$\begin{aligned}&= \text{Total manufacture cost} + \text{profit} \\&= 160.0736 + 32.88 \\&= ₹ 192.7\end{aligned}$$