Two marks-Manufacturing Technology-I

University Questions and Answers

Questions and Answers

Unit I

1 Name the steps involved in making a casting.
Ans: Steps involved in making a casting are

(1) Pattern making	(2) Sand mixing and preparation
(3) Core making	(4) Melting
(5) Pouring	(6) Finishing
(7) Testing	(8) Heat treatment
(9) Re-testing	

2 What are the applications of casting ?
Ans: Transportation vehicles (in automobile engine and tractors)

- Machine tool structures
- Turbine vanes and power generators
- Mill housing
- pump filter and valve

3 Define pattern.
Ans: A pattern is defined as a model or replica of the object to be cast.
A pattern exactly resembles the casting to be made except for the various allowances.

4 Define mould making.
Ans: It is a model or form around which sand is packed to give rise to a cavity called as **mould cavity,** in which molten metal is poured and the casting is produced.

5 Why is a pattern larger than casting ?
Ans: A pattern is slightly larger than the casting because a pattern carries allowance compensate for metal shrinkage.

6 What do you mean by coreprints in pattern ?
Ans: To produce seats for the cores in the mould in which cores can be placed, for producing cavity in the casting. Such seats in the mould are called as coreprints.

7 Name the functions of
pattern. Ans:
(1) Prepare a mould cavity
(2) To produce seats for the cores
(3) To establish the parting line
(4) To minimize casting defects.

8 Name the materials for making patterns

Ans: The common materials of which the patterns are made are as follows:

(1) Wood (2) Metal (3) Plastic
(4) Plaster (5) Wax

9 List the various alloys and metal used in pattern.

Ans: The various metals and alloys employed for making patterns ate :

(a) Aluminium and its alloys (b) Steel
(c) Brass (d) Cast iron
(e) White metal

10 Explain wax moulding.

Ans: After being moulded, the wax pattern is not taken out; rather the mould is inverted and heated and the molten wax comes out or gets evaporated, hence there is no chance of the mould cavity getting damaged while removing the pattern.

11 List the allowances of pattern.

Ans: The following allowances are provided on the pattern :

(a) Shrinkage or contraction allowance
(b) Machining allowance
(c) Draft or taper allowance
(d) Distortion allowance
(e) Rapping or shake allowance

12 List the three forms of contraction. Ans:

Contraction takes place in three forms

(1) Liquid contraction
(2) Solidifying contraction
(3) Solid contraction

13 Shrinkage of metal depends on what factors ?

Ans: The shrinkage of metal depends on the following factors :

(1) The metal to be cast
(2) Pouring temperature of the molten metal
(3) Dimensions of the casting
(4) Method of moulding

14 What do you mean by finish allowance ?

Ans: Machining allowance or finish allowance is the amount of dimension on a casting which is made oversized to provide stock for machining.

15 What are the factors on which amount of machining depends ?

Ans: Factors affecting machining are

(1) Metal of casting
(2) Machining method used
(3) Casting method used
(4) Shape and size of the casting
(5) Amount of finish required on the machined portion

16 Why is a taper allowance used ?
Ans: Draft allowance or taper allowance is given to all vertical faces of a pattern for their easy. Removal from sand without damaging the mould.

17 When does warpage occur
? Ans: Warpage occurs when

(1) It is of irregular shape.
(2) It is of U or V-shape
(3) The arms having unequal thickness.
(4) One portion of the casting cools at a faster rate than the other.

18 How do you eliminate warpage ?
Ans: To eliminate this defect, an opposite distortion is provided on the pattern, so that the effect is balanced and correct shape of the casting is produced

19 Enlist the factors affecting selection of types of pattern.
Ans : The type of pattern to be used for a particular casting will depend on following factors :
(1) Quantity of casting to be produced
(2) Size and shape of the casting
(3) Type of moulding method
(4) Design of casting

20 Name any four types of pattern.
Ans: The various types of patterns which are commonly used are as follows :
(1) Single piece or solid pattern
(2) Two piece or split pattern
(3) Loose piece pattern
(4) Cope and drag pattern
(5) Gated pattern

21 Write the significance of loose moulding.
Ans: Some patterns embedded in the moulding sand cannot be withdrawn, hence such patterns are made with one or more loose pieces for their easy removal from the moulding box.

22 Name and give use of the pattern in which number of casting are made at a time
Ans:Gated pattern
by using gated patterns number of casting can be made at atime, hence they are used in mass production system.

23 Piston rings are made by .....pattern
Ans : Match plate pattern
These patterns are made in two pieces i.e. one piece mounted on one side and the other on the other side of the plate, called as match plate.

24 What is the difference between sweep and segmental pattern?
Ans: The main difference between them is that, a sweep is given a continous revolving motion to generate the required shape, whereas a segmental pattern is a portion of the solid pattern itself and the mould is prepared in parts by it.

25 Why are patterns coloured ?
Ans: Patterns are provided with certain colours and shade for following reasons:
(i) To identify quickly the main pattern body and different pattern parts.
(ii) To indicate the type of the metal to be cast.
(iii) To identify loose pieces, core prints,etc.
(iv) To visualise machined surfaces, etc.

26 Selection of mould materials depends on.....

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Ans: selection depends on following factors

(i) cost of the material
(ii) Quality of casting required
(iii) Number of casting required
(iv) Shape and size of the casting
(v) Material to be cast,etc.

27 What are the types of moulding sand?

Ans: All types of sands used in the foundry can be grouped as:

1. Natural sand 2. Synthetic sand 3. Special sands

28 Why is synthetic sand better than natural sand?

Ans:

(1) It requires less propotion of binder.
(2) Higher refractoriness and permeability.
(3) Properties can be easily controlled.
(4) Refractory grain size is more uniform.

29 Name the different types of special sand.

Ans: Types of special sand are

(1) Green sand (2) Loam sand (3) Core sand
(4) Parting sand (5) Facing sand (6) Backing sand

30 Define black sand

Ans : It is the sand which backs up the facing sand and does not come in direct contact with the pattern. This sand has black colour and hence, sometimes called as black sand.

31 Define green strength.

Ans : A mould which has adequate green strength will retain its shape and does not distort or collapse, even after the pattern has been removed from the moulding box.

32 Define permeability.

Ans : The sand must be porous to allow the gases and steam generated within the moulds to be removed freely. This property of sand is known as permeability or porosity.

33 Name the constituents of moulding sand.

Ans : The main constituents of moulding sand are :

(1) Sand (2) Binder
(3) Additives (4) Water

34 Classify binders and name the types in it

Ans :

1) Organic binders
   (a) Linseed oil (c) Dextrin
   (b) Molasses (d) Pitch
   2) Inorganic binders
   (a) Clay, (b) Sodium silicate
   (c) Portland cement

35 Name the types of clay binders

Ans: Clay binder which is most widely used have following types:

(a) Bentonite (b) Fire clay (c) Limonite
(d) Ball clay (e) Kaolonite

36 Additives are used so as to.....

Ans: 1) To enhance the existing properties.
2) To develop certain other properties like resistance to sand expansion defects, etc.

37 What do you mean by coal dust ?

Ans: It reacts chemically with the oxygen present in the sand pores and thus, produces a reducing atmoshpere at the mould metal interface and prevents oxidation of the metal.

38 Functions of sand preparation are.....

Ans:

(1) To develop optimum properties in the moulding sand.
(2) To obtain even distribution of sand grains throughout the bond.
(3) To add suitable amount of water to activate clay binder.
(4) To deliver sand at the suitable temperature.

39 Define Muller.

Ans: It is a mechanical mixer used for mixing sand ingredients in dry state.

40 Name various methods of sand testing.

Ans:

(1) Moisture content test (2) Clay content test
(3) Permeability test (4) Grain fineness test

41 Name the factors affecting permeability test

Ans: permeability depends on the following factors:

Grain shape and size
Grain distribution
Binder and its contents
Water amount in the moulding sand Degree of ramming

42 Enlist the functions of core.

Core provides a means of forming the main internal cavity for hollow casting.
Core provides external undercut feature.
Cores can be inserted to obtain deep recesses in the casting.
Cores can be used to increase the strength of the mould.

43 Define Core.

Ans: Core is a sand shape or form which makes the contour of a casting for which no provision has been made in the pattern for moulding.

44 Difference between core sand and mould sand.

Ans: The main difference is that core sand has very low clay content and larger grain size.

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45 Core sand mixture consists of...

Ans: Core sand mixture consists of sand, 1% core oil, 1% cereal and 2.5 to 6% of water.

46 Name the core sand ingredients.

Ans: Ingredients are

(1) Granular refractories (2) Core binders

(3) Water (4) Additives

47 What does core making consists of ?

Ans: Core making basically consists of following steps:

(1) Core sand preparation (2) Core making

(3) Core baking (4) Core finishing or dressing

(5) Setting the cores

48 Define core driers.

Ans: The special shapes, which support the green sand cores having curved surfaces, are known as core driers.

49 List various types of core.

Ans: Their main types are as follows

(1) Horizontal core (2) Vertical core (3) Hanging core

(4) Balanced core (5) Ram up core (6) Kiss core

(7) Drop core

50 What is core box ?

Ans: Core box is a pattern for making cores. They are employed for ramming cores in them. Core boxes provide the required shape to the core sand.

51 Name the types of core boxes.

Ans:

(1) Half core box (2) Dump core box

(3) Split core box (4) Strickle core box

(5) Gang core box (6) Loose piece core box

(7) Left and right hand core boxes

52 Why do we use a core prints ?

Ans: Core prints are basically extra projections provided on the pattern. They form core seats in the mould when pattern is embedded in the sand for mould making. Core seats are provided to support all the types of cores.

53 Name the types of core prints.

Ans: Core prints are of the following types:

(i) Horizontal core print (ii) Vertical core print

(iii) Balanced core print (iv) Cover core print

54 Define mould.

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Ans: When the pattern is removed, a cavity corresponding to the shape of the pattern remains in the sand which is known as mould or mould cavity

55 What is loam moulding ?

Ans: In this, a rough structure of component is made by hand using bricks and loam sand. The sand used is known as loam sand or loam mortar.

56 Explain in short shell moulding.

Shell moulding is suitable for thin walled articles.

It consists of making a mould that has two or more thin shell like parts consisting of thermosetting resin bonded sand.

57 Name any six hand mould tools

Ans: A number of hand tools are

(1) Shovel (2) Hand riddle (3) Rammers

(4) Lifters or cleaners (5) Draw spike (6) Bellow

58 Functions of moulding machine.

Ans: The main functions of moulding machines are:

Ramming of moulding sand.

Rolling over or inverting the mould through 180^0

Rapping of pattern.

Removing the pattern from the mould.

59 Name the types of moulding machine.

Ans: Following are the types of moulding machines:

(a) Squeeze moulding machines (b) Jolt moulding machines

(c) Jolt-squeezing machines (d) Sand slinger

60 Difference between permanent mould casting and sand casting.

Ans: The main difference between permanent mould casting and sand casting is that, in this the mould is permanent which is neither destroyed nor remade after each cast.

61 Name the type of die casting machine. Ans: The main types of die-casting machines are:

(a) Hot chamber die-casting

(b) Cold chamber die-casting

62 Classify centrifugal casting.

Ans: Centrifugal casting processes can be classified as:

(a) True centrifugal casting (b) Semi-centrifugal casting

(c) Centrifuging

63 What do you mean by shaking out operation ?

Ans: After solidification of casting, the mould are broken to obtain the final casting. This operation is known as shake out operation, which may be performed manually or mechanically.

64 Operations performed after shaking are.....

Ans: The various operations which are performed after shake out are as follows :

(a) Removal of dry sand cores.
(b) Removal of gates, risers, runners, etc.
(c) Removal of unwanted metal projections, fins, etc.
(d) Removal of adhering sand and oxide, scale from the casting surface.

65 Define snagging.
Ans: The operation of removal of unwanted metal projections and fins is called as **snagging.**

66 Name defects occurring in casting.
Ans:
(1) Blow holes (2) Porosity (3) Shrinkage
(4) Inclusions (5) Hot tears or hot cracks
(6) Misrun and cold shuts

67 Name the inspection methods of casting .
Ans:
(1) Pressure test (2) Magnetic particle test
(3) Dye penetrant test (4) Radiographic inspection
(5) Ultrasonic inspection (6) Visual inspection

68 What is the difference between magnetic and dye penetrant testing ?
Ans: Magnetic testing is used for magnetic materials and dyes are used for non-magnetic materials.

PART-B (16 MARKS)

i. Discuss the properties of moulding sand

What are the various moulding methods, explain them

i. Explain the working principle of investment casting

Discuss the casting defects and their inspection methods

i. What are the pattern making allowances and briefly explain them

Describe centrifugal casting process

- i. Describe the shell moulding process

Explain the ceramic moulding process and state its merits and demerits

- i. What are the factors which govern the selection of a proper material for pattern making?

ii. What are the specific advantages of match plate patterns? Explain how they are used for making mould

6. .i. Classify the types of patterns and sketch any three of them

ii. What is core and explain how to make a core?

- i. Explain the construction and operation of Cupola furnace with diagram

  Write a short note on “Chills”

8 .i. Describe various materials used for making patterns. What are its merits and demerits

ii. What are the basic requirements of core sand? How does it differ from the moulding sand?

9.i. What are the different types of furnace used in foundry? Describe in detail with neat sketches any one of them

ii. Describe the steps involved in the preparation of green sand mould with cope and drag pattern

10. i. Briefly explain cold-chamber die casting process with a neat sketch

ii. What are the advantages of centrifugal casting?

Unit II

1 Define weldability.

Ans: Weldability is defined as the capacity of a material to be welded under fabrication conditions imposed in a specific and suitably designed structure and to perform satisfactorily in the intended service.

2 State requirement of a good weldability.

Ans: A metallic material with adequate weldability should fulfil the following requirements:

- Have full strength and toughness after welding.
- Contribute to good weld quality even with high dilution.
- Have unchanged corrosion resistance after welding.
- Should not embrittle after stress relieving.

3 How is welding classified? Ans:

Welding is classified as

- Gas welding
- Arc welding
- Resistance welding
- Solid state welding
- Thermo-chemical welding processes
- Radiant energy welding processes

4 Name the applications of welding.

Ans: Applications of welding are

- Aircraft construction
- Buildings
- Rail road equipment
- Automobile construction
- Pressure vessels and tanks
- Pipings and pipelines

- Ships

5 Write in short about gas welding.

Ans: Gas welding is a fusion-welding or non-pressure welding method. It joins the metals, by using combustion heat of oxygen/air and fuel gas (acetylene, hydrogen, propane or butane) mixture.

6 Name the types of gas welding.

Ans: Following are the types of gas welding.

(a) Oxy-acetylene welding (b) Air-acetylene welding

(c) Oxy-hydrogen welding (d) Pressure gas welding

7 Explain the principle of oxy-actelyene welding.

Ans: When acetylene, in correct proportion, is mixed with oxygen in a welding torch and ignited, then the flame resulting at the tip of the torch is sufficiently hot to melt and join the parent metals.

8 Name the types of flames.

Ans: The generated flames are classified into following three types

(a) Neutral flame (Acetylene and oxygen in equal proportion)

(b) Oxidising flame (Excess of oxygen)

(c) Reducing flame or carburising flame (Excess of acetylene)

9 Explain neutral flame.

Ans: The flame has a nicely defined inner cone which is light blue in colour and surrounded by an outer flame envelope.

10 What are the metals welded using neutral flame?

Ans: A neutral flame is mostly used for the welding of:

- Mild steel
- Aluminium
- Copper
- Cast iron
- Stainless steel

11 How do we obtain oxidizing flame using neutral flame ?

Ans: If, after the neutral flame has been established, the oxygen supply is further increased then oxidising flame will be developed.

12 How does the flame of an oxidizing flame look?

Ans: It is recognised by the small white cone which is shorter, much bluer in colour and more pointed than neutral flame.

13 Where is oxdizing flame used?

Ans: An oxidising flame is used for :

- Copper-base metals
- Zinc-base metals
- Ferrous metals such as manganese steel, cast iron, etc.

14 Define carburizing flame.

Ans: If the amount of oxygen supplied to the neutral flame is reduced, then the generated flame will be a carburising flame or reducing flame i.e more content of acetylene.

15 Name the metals welded by carburising flame.

Ans: This flame is generally used for:

- Welding of low alloy steel rods
- Non-ferrous metals
- High carbon steel

16 Write down the methods of welding.

Ans: There are three typical methods that may be used which are as follows:

(a) Leftward or fore-hand welding method
(b) Rightward or back-hand welding method
(c) Vertical welding method

17 What do you mean by filler metal?

Ans: Filler metal is the material which is added to the weld pool to assist in filling the gap.

18 Explain the function of flux in welding.

Ans: While welding, if the metal is heated in air then the oxygen from air combines with the metal to form oxides. This results in poor quality, low weld strength hence, to avoid this difficulty a **flux** is employed during welding. It prevents the oxidation of molten metal.

19 What is the disadvantages of flux.

Ans: Fluxes used in welding produces fumes that are irritating to the eyes, nose, throat and lungs.

20 Give the applications of gas welding.

Ans: Gas welding is most widely used for the following purposes:

- Joining thin materials.
- Joining most ferrous and non-ferrous metals.
- In automobile and aircraft industries.
- In sheet metal fabricating plant.

21 What is arc welding?

Ans: Electric arc welding is a fusion welding process in which welding heat is obtained from an electric arc between an electrode and the workpiece.

22 Define arc length and arc crater.

Ans: The distance between the centre of arc of the electrode tip and the bottom of arc crater is called as **arc length.** A small depression is formed in the base of the metal which is called as **arc crater.**

23 Name the equipments of gas welding

Ans: The most commonly used equipments for arc welding are as follows:

(a)	A.C or D.C machine	(b)	Wire brush	(c)	Cables and connector
(d)	Earthing clamps	(e)	Chipping hammer	(f)	Wire brush
(g)	Helmet	(h)	Safety goggles	(i)	Cable lug
(j)	Hand gloves, apron, etc.				

24 What are the functions of a coating on electrode?

Ans:

(1) The coating improves penetration and surface finish.
(2) Suitable coating will improve metal deposition rates.
(3) It limits spatter, produces a quite arc and easily removes slag.
(4) Core wire melts faster than the covering, thus forming a sleeve of the coating which

constricts and produces an arc with high concentrated heat.

(5) Coating saves the welder from the radiations.

25 Name the types of arc welding.

Ans: The main types of arc welding are as follows:

(a) Carbon arc welding (b) Shielded metal arc welding
(c) Submerged arc welding (d) Gas tungsten arc welding
(e) Gas metal arc welding (f) Electro slag welding
(g) Plasma arc welding (h) Flux cored arc welding
(i) Stud arc welding

26 Define SMAW.

Ans: It is an arc welding process where coalescence is produced by heating the workpiece with an electric arc set up between the flux coated electrode and the workpiece.

27 What is submerged arc welding ?

Ans: It is an arc welding process where coalescence is produced by heating, with an electric arc set up between bare metal electrode and workpiece.

28 Explain in short plasma arc welding.

Ans: It is an arc welding process where coalescence is produced by the heat obtained from a constricted arc set up between a tungsten electrde and the water cooled nozzle or the workpiece. The process employs two inert gases i.e. one forms the plasma arc and the second shields the plasma arc.

Filler rod may or may not be added and pressure is not required for welding.

29 Write about special feature of flux cored welding.

Ans: The electrode is **flux cored** i.e. flux is contained within the hollow electrode. The flux cored electrode is coiled and supplied to the arc as a continuous wire. The flux inside the wire provides the necessary shielding of the weld pool.

30 Give the applications of flux cored welding

Ans: Applications of flux core welding are

(1) Bulldozer blades, main frames (2) Rotating frames for cranes

(3) Tractor frames, punch press frames (4) Bridge girders, furnace tubes
(5) Diesel engine chassis, etc.

31 Explain resistance welding and its filler metal.

Ans: Resistance welding is a process where coalescence is produced by the heat obtained from resistance offered by the workpiece to the flow of electric current in a circuit of which the workpiece is a part and by the application of pressure. Filler metal (rod) is not required during the process.

32 What are the factors affecting resistance welding?

Ans: Four factors are involved in operation of resistance welding: ○

Amount of current passing through the workpiece.

- The pressure that electrodes transfer to the workpiece.
- Time during which current flows.

- Area of electrde tip in contact with the workpiece.

33. Write the applications of resistance welding

Ans: This process is used for:

- Joining of sheets, bars, rods and tubes.
- Making of tubes and furniture.
- Welding of aircraft and automobile parts.
- Making of cutting tools, fuel tanks of cars, tractors, etc.

34 Name the types of resistance welding

Ans: Resistance welding process includes following methods:

(a) Spot welding (b) Seam welding
(c) Projection welding (d) Percussion welding
(e) Flash butt welding (f) Resistance butt welding
(g) High frequency resistance welding

35 What is adhesive bonding?

Ans: Adhesive bonding is the process of joining materials by using adhesives. The term adhesive includes substances such as glues, cements and other bonding agents.

36 Write the main steps of adhesive bonding

Ans: Main steps in adhesive bonding are

(1) Surface Preparation (2) Applying the primer
(3) Applying the adhesive (4) Assembling adhesive coated components
(5) Curing the assembly (6) Testing of the joints

37 Give various mediums of applying adhesives.

Ans: Medium of applying the adhesive on the surfaces to be joined are as follows:

- Liquid
- Tape
- Film
- Solution
- Powder
- Paste

38 Name types of adhesives.

Ans: The most commonly used adhesives are as follows:

(a) Thermoplastic adhesives
(b) Thermoseatting adhesives

39 Explain thermoplastic adhesives.

Ans: Thermoplastic type adhesives soften at high temperature. They are easy to use and are employed as, air drying dispersions, emulsions or solutions that achieve their strength through the evaporation of the solvent.

40 Explain thermosetting adhesives.

Ans: Thermosetting adhesives, once hardened cannot be remelted and a broken joint cannot be rebounded by heating also. These types of adhesives cure or harden by chemical reactions like polymerisation, condensation, vulcanisation or oxidation caused by the addition of a catalyst; heat, pressure, radiations, etc.

41 Name any four synthetic adhesives and their applications.

Ans:

Phenolic	Strucural bonding, plywood
Acrylic	Bonding of plastics, glass
Epoxy	Structural bonding, concrete repair, construction industries
Olefin polumers	Laminating, packaging, book-binding
Polyurethane	Bonding of flexible to non-flexible substrate
Urea	Plywood, furniture

42 Give the applications of adhesive bonding

Ans: Adhesive bonding are used in following indistries:

(a)	Automotive	(b)	Aircrafr
(d)	Furniture	(e)	Ship-building
(g)	Shoe and apparl	(h)	Medical and dental
(j)	Railroad	(k)	Tape, etc.
(c)	Packaging		
(f)	Book-binding		
(i)	Electrical		

43 Define soldering and classify it.

Ans: It is defined as a group of joining processes where coalescence is produced by heating to a suitable temperature and by using a filler metal having a liquidus not exceeding 427^0 C and below the solids of base metals.

Soldering is clasified as Sofr solder, Hard solder.

44 Define soft and hard soldering.

Ans: **Soft soldering** is used in sheet metal work for joining parts that are not exposed to the high temperature action and not subjected to excessive loads and forces.

Hard soldering used solders which melt at higher temperatures and are stronger than those used in soft soldering.

45 What is brazing?

Ans: It is defined as a group of joining processes where coalescence is produced bu heating to a suitable temperature and by using a filler metal having a liquidus above 470^0 C and below the solids of the base metal.

46 Name the methods of brazing.

Ans: There are various brazing methods such as:

- Torch brazing
- Resistance brazing
- Immersion brazing
- Furnace brazing

47 What do you mean by bronze welding?

Ans: Bronze welding does not mean the welding of bronze , but it is a welding using bronze filler rod.

48 Name different defects in weld.

Ans: Some common weld defects are listed below:

(a)	Cracks	(b)	Distortion	(c)	Inclusions
(d)	Porosity and blow holes	(e)	Undercutting	(f)	Overlapping
(g)	Spatter	(h)	Poor fusion		
(i)	Poor weld bead appearance	(j)	Incomplete penetration		

PART-B (16 MARKS)

1. i. Distinguish between gas and arc welding

   ii. What are the advantages of welding?

   iii. Explain percussion welding

2. i. Describe Electro slag welding

   ii. Distinguish between soldering and brazing

3..i. Explain spot welding

   ii. Explain submerged are welding

1) i. Explain the electron beam welding process with a neat sketch

   Write a brief note on “Welding defects”

2) i. Sketch the three types of Oxy-acetylene flames and state their characteristics and applications.

Describe the electro-slag welding process with a neat sketch.

3) i. What is the principle of resistance welding and explain the seam welding?

Describe plasma arc welding

4) i. What are the different types of electrode? What are the functions of flux coating?

What is the principle of friction welding?

5) i. Describe metal inert Gas arc welding process with a neat sketch.

Briefly explain on butt welding process

9.i. Give a brief account of classification of welding processes?

ii. Explain TIG welding process variables and enumerate its advantages

5 i. Describe shielded metal arc welding process with suitable diagram. What are its applications?

What is the difference between welding, brazing and soldering process?

Unit III

1 What is mechanical working ?

Ans: Mehanical working fo a metal is a simply plastic deformation performed to change the dimensions, properties and suface conditions with the help of mechanical pressure.

2 Define cold and hot working in short.

Ans: Mechanical working of metals above the recrystallisation temperature, but below the melting or burning point is known as hot working whereas; below the recrystallisation temperature is known as **cold working**.

3: Give the principal hot working process.

Ans: The Principal hot working process applied to various metals are as follows:

1. Hot rolling 2. Hot extrusion 3. Hot spinning
4. Roll piercing 5. Hot drawing 6. Hot forging

4: What is the purpose of rolling ?

Ans: The main purpose of rolling is to convert larger sections such as ingots into smaller sections, which can be used directly in as rolled state or stock for working through other process.

5: Name the commonly used rolled sections.

Ans : Commonly rolled sections are flat, tee, angle, channel, round, I-section.

6: What are the types of rolling mills?

Ans: According to the number and arrangement of the rolls, rolling mills are classified as follows:

1. Two-high rolling mill 2. Three-high rolling mill
3. Four-high rolling mill 4. Tandem rolling mill
5. Cluster rolling mill 6. Planetary rolling mill

7: Explain cluster rolling mill.

Ans: It is a special type of fourhigh rolling mill. In this, each of the two working rolls is backed up by two or more of the larger back up rolls.

8: What is tandem rolling mill ?
Ans: It is a set of two or three stands of rolls set in parallel alignment. This facilitates a continuous pass through each one successively without change of direction of the metal or pause in the rolling process.

9 What is the main function of planetary rolling mill?
Ans: The main feature of this mill is that, it reduces a hot slab to a coiled strip in a single pass.

10 Which mill is attached to end of planetary mill and what is it's function?
Ans: On the exit side planishing mill is installed to improve the surgace finish.

11 Define extrusion.
Ans: The extrusion process consists of compressing a metal inside a chamber to force it out through a small opening which is called as **die.**

12 Name the method of extrusion.
Ans: The different methods of extrusion are **hot extrusion** and **cold extrudion.**

13 What are the factors affecting choice of extrusion?
Ans: The factors which govern the choice are:
a) Metal to be extruded b) Thickness of the extrusion section
c) Raw material size d) Capacity of the press
e) Product typ, etc.

14 How is hot extrusion sub-divided?
Ans: Hot extrusion process is subdivided as follows:
(a) Direct or forward extrusion (b) Indirect or backward extrusion
(c) Tube extrusion

15 What is discard?
Ans: Generally, last 10% length of billet is unextrud which is known as discard (waste) and it contains the surface impurities of the billet.

16 Give the other name of indirect ans direct extrusion.
Ans: Direct extrusion is also called as **forward extrusion.**
Indirecr extrusion ia also called as **backward extrusion.**

17 Which extrusion requires less force and dedfine it.
Ans: As compared to direct extrusion, less total force is required in indirect extrusion.
In this type, the ram or plunger used is hlollw and as it presses the billet against the backwall of the closed chamber, the metal is extruded back into the plunger.

18 What is forging?

Ans: Forging is the process of shaping heated metal by the application of sudden blows (hammer forging) or steady pressure (press forging) and makes use of the characteristic

of plasticity of the material.

19 How is forging classified?

Ans: According to the equipments utilised for forging, they are classified as follows:

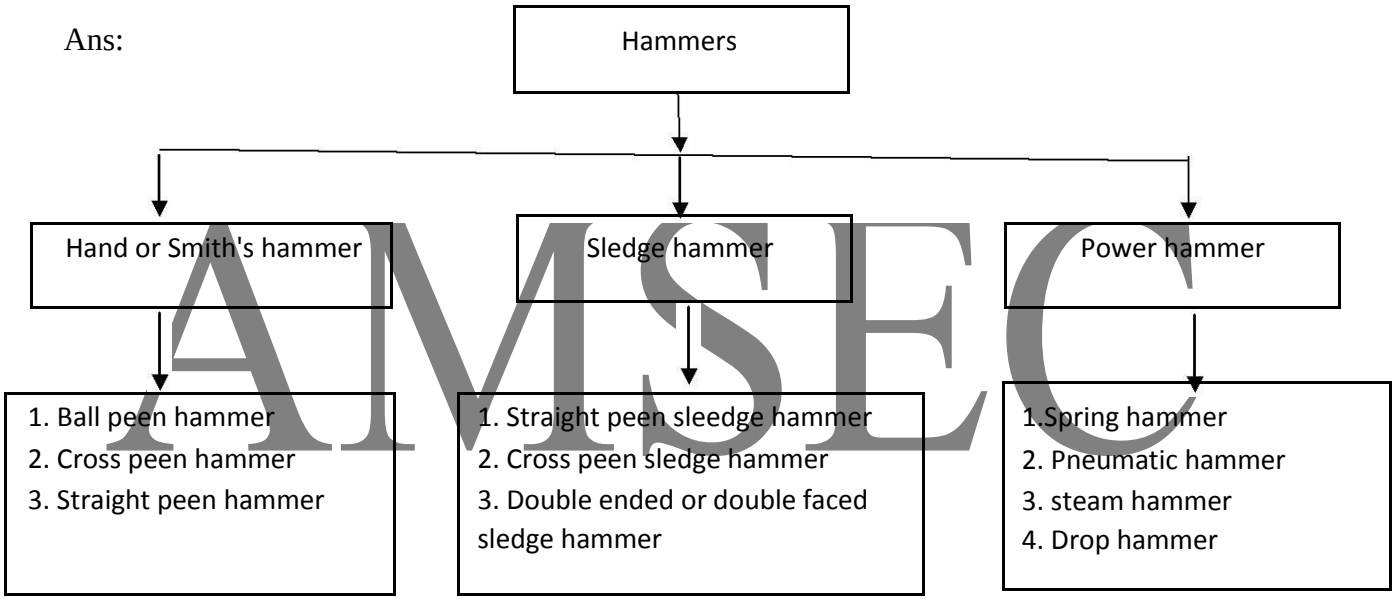
1. Smith die (Open die) forging;
   (a) Hand forging (b) Power forging
2. Impression die (Closed die) forging:
   (a) Drop forging (b) Press forging
   (c) Maching or upset forging (d) Roll forging

20 Define smithing.

Ans: Smithing is the act or art of working on forging metals, as iron, into any required shape.

21 Give the classification of hammers.

Ans:



22 Classify smith's hammer.

Ans: Smith's hand hammers are small in size and of following types:

1. Ball peen hammer
2. Cross peen hammer
3. Straight peen hammer

23 Define ball peen hammer.

Ans: It is most suitable hammer for hand forging operations. It has a tough cast steel or forged steel head which is fitted to a wooden handle. Once end of the head is flat called as **face** i.e. haedened and polished. It is used for general striking and hammering purpose. Another end is half ball shaped called as **peen** i.e. used for riveting or burring-over purpose.

24 Define cross peen hammer.

Ans: **Cross Peen Hatmer:** In this type of hammer, peen is at right angle to the axis of the handle of the hammer. It is used for heading, stretching and hammering into the inner portions of the component.

25 Define straight peen hammer.

Ans: In this type of hammer, peen is paralled to axis of handle of the hammer. It is used for stretching the metal.

26 How are sledge hammers classified?

Ans: Sledge hammers are larger in size as compare to hand hammers and of following types:

1. Straight peen hammer
2. Cross peen hammer
3. Double ended or double faced hammer

27 The striking surface of the sledge hammer is ..... Why?

Ans: To avoid the damage of workpiece surface, the striking surface fo the sledge hammer is made slightly convex and smooth.

28 When is a hammer called double ended?

Ans: If the hammer has no peen formation and instead carries flat faces at both ends, then it is called as **double ended** or double **faced hammer.**

29 What are power hammers?

Ans: Machines which work on the dprinciple of repeated blows are called as **forging hammers** or **power hammers.**

30 Classify power hammers.

Ans: Forging or power hammers are of following types:]

1. Spring hammer
2. Pneumatic hammer
3. Steam or air hammer
4. Drop hammer.

31 Why is hand lever used?

Ans: To adjust the stroke of the connecting rod and intensity of blows, hand lever is used.

32 What are the types of drop hammer used to make drop forging?

Ans: Three types of drop hammers are used in making drop forgings:

- Board or gravity hammer
- Air-lift hammer
- Power drop hammer or steam hammer

33 Differentiate between bydraulic and mechanical press (Two points only)

Ans:

Sr. No.	Hydraulic Press	Mechanical Press
1.	Hydraulic presses are used for heavy work.	Machanical presses are used for light work.
	Operating speed of hydrulic presses is slow.	Machanical presses operate faster than hydraulic presses.

34 Explain machice forging.

Ans: Machine forging is also called as hot heading. It consists of applying pressure longitudinally on a hot bar, which is gripped firmly between grooved dies, to upset a required portion of its length.

35 Differentiate between press and drop forging.

Ans:

Sr. No.	Press forging	Hammer/Drop forging
1.	Press forging is slowa as compared to hammer forging, but the reduction in the size of heavy parts is comparetively repid.	Hammer forging is fast process, but a large number of blows are applied in rapid succession for reduction in the size of heavy parts.
2.	In press forging there is no restriction of the component.	In hammer forging there is a restriction of the component size.

36 What is heading tool?

Ans: The dies are so designed that, the complete operation is performed in several strages and the final shape is attained gradually. The operation is performed by using die and punch which is called as **heading tool.**

37 What is roll forging?

Ans: Roll forging process consists fo placing raw stock between two roll dies which are of semi-cylindrical form and are grooved to impart a desired shape to the workpiece being forged.

38 Name the typical forging operations.

Ans: A typical smith forging operations are as follows:

1. Upsetting
2. Drawing out or drawing down
3. Cutting
4. Bending
5. Punching and Drifting
6. Setting down
7. Fullering
8. Welding

39 What is upsetting ?

Ans: It is a process through which the cross-section of a metal piece is increased with a corresponding increase in its length.

40 Name the opposite process to upsetting process (Define it).

Ans: Drawing out is exactly a reverse process to that of upsetting. It is employed when a reduction in thickness, width of a bar is desired with a corresponding increase in its length.

41 Define cutting.

Ans: Cutting-off is a form of a chiseling whereby a long piece of stock is cut into several specified lengths, or a forging is cut-off from its stock.

42 What is drifting?

Ans: In drifting, a tool known as **drift,** is made to pass through the punched hole to produce a finished hole of the required size.

43 What is setting down?

Ans: Setting down is the operation through which the rounding of a corner is removed, to make it square by uaing a set hammer.

44 Explain fullering.

Ans: Fullering is also called as **spreading.** Fullering the metal along the length of the workpiece is done bu working spearate sections. In this, the axis of the workpiece is positoned perpendicular to the width of the flat die.

45 When is sound weld produced?

Ans: For production of sound weld, the surfaces in contact must be oerfectly clean, both mechanically and chemically so that cohesion will take place when the metal is in a plastic state.

46 What is scarfing?

Ans: The method of preparing the metal pieces for welding called as **scarfing.**

47 Name the type of weld joints.

Ans: Following are the forms of welded joint which are commonly used:

a) Lap scarf weld
b) Butt weld
c) T or Jump weld
d) V-weld or splice

48 Explain any 2 types of weld joints.

Ans:

a) **Lap scarf weld:** In this, the ends are prepared so that they may be welded one upon the other with the joint in an inclined position.

b) **Butt weld:** In this, the ends of the pieces to be joined are butted together, the weld being between the ends at right angles to the length of the piece.

49 Name any 4 defects of forging.

Ans: The defects commonly observed in forged components are as follows:

1. Defective metal structure
2. Presence of cold shuts or cracks at corners or surfaces:
3. Incomplete components:
4. Mismatched forging

50 Give 2 ways of removing forging defects. Ans:

Forging defects can be removed as follows:

- Shallow cracks and cavities can be removed by chipping out of the cold forging with pneumatic chisel.
- Surface cracks are removed from forging by grinding on special machines. Care should be taken to see that the component is not under-heated, overheated or burnt.

51 Name the process of seamless tubes and Why is it used?

Ans: Roll piercing is a method of producing seamless tubing is a popular and economical raw stock for machining because it saves drilling and boring of parts.

52 Define cold working.

Ans: The working of metals at temperatures below their recrystallisation temperature is called as **cold working.**

53 Give the methods of cold working.

Ans: The principal methods of cold working are as follows:

1. Cold rolling
2. Cold rolling
3. Cold spinning
4. Stretch forming

5.	Cold forging and Swaging	6.	Cold extrusion
7.	Coining	8.	Embossing
9.	Cold bending	10.	Roll forming
11.	Shot peening	12.	High Energy Rate Forming (HERF)

54. Differentiate between hot and cold working.

Ans :

S.No.	Hot rolling	Cold rolling
1.	Metal is fed into the rools after being heated above recrystallisation temperature.	Metal is fed into the rolls when its temperature is below recrystallisation temperature.
2.	Hot rolled metal does not show work hardening effect.	Cold rolled metal shows work hardening effect.
3.	Coefficient of friction between the rolls and stock is higher.	Coefficient of friction between rolls and stock is relatively lower.

55. Classify shape rolling.

Ans : Shape rolling process can be divided in two parts.

1. Ring rolling
2. Thread rolling

56 Give the types of thread roling machines.

Ans: There are three types of thread rolling machnies:

(i) Reciprocating flat die machines.

(ii) Cylindrical die machnies.

(iii) Rotary planetary machines having rotary die and one or more stationary concave-die segments.

The choice of machine depends upon the size and design of the workpiece, the work material and the number of pieces to be produced.

57 Name the type of rolling which cannot be used for RC 37 and define it.

Ans: Thread rolling. It is actually a cold working process in which a plastic deformation takes place.

58 Name the defects in rolled parts.

Ans: There are following types of defects which can be observed in rolled components:

1. Surface defects
2. Internal strutural defects
3. Other defects

59 Define surface defects.

Ans: Surface defects include defects like scale, rust, cracks, scratches, gouges, etc. It occurs due to the impurities and inclusions in the original cast material and different conditions related to material preparation and rolling operation.

60 Name the defects in internal structural defects.

Ans: These type of defects include following defects:

i)	Wavy edges	ii)	Zipper cracks
iii)	Edge cracks	iv)	Alligatoring
v)	Folds	vi)	Laminations

61 What are Zipper cracks?

Ans: Due to uneven ratio of mean thickness to the length of the deformation zone, cracks may produce in the centre fo the sheet. These cracks are called as **Zipper cracks.**

62 Explain Folds and Laminations.

Ans:

Folds: Folds are produced during plate plate rolling if the reduction per pass is very smsll.

Laminations: Due to incomplete welding of pipe and blow holes during rolling, internal defects or laminatons which decreases the strength of material.

63 Waht happens due to swaging?

Ans: By swaging, one end of a tube is reduced in diameter and passed through the die, whereas on the other side of the die this end is gripped in tongs which are connected to the draw bench.

64 What is cold forging?

Ans: Cold forging is a cold upsetting process adapted for large scale production of small cold upset parts from a wire stock. For example, small bolts, rivets, screws, pins, nails and small machine parts, small balls for ball bearings, etc.

65 Define swaging.

Ans: Rotary swaging is a process of reducing the cross-sectional shape of bars, rods, tubes or wires by a large number of impacting blows with one or more pairs of opposed dies.

66 Give the advantages of swaging.

Ans: Advantages of swaging:

- Tooling cost is high.
- Maintenance is easy.
- Initial investment is high.
- Semi-skilled operator is required, hence low labour cost.
- Production rate is high.
- Consistancy of the product.

67 Compare hot and cold working.

Ans:

Sr. No.	Hot working	Cold working
1.	Hot working is carried out above the recrystallisation temperature but below the melting point, hence deformation of metal and recovery takes place simultaneously.	Cold working is carried out below the recrystallisation temperature and as such there is not appreciable recovery of metal.
2.	During the process, residual stresses are not developed in the metal.	During the process, residual stresses are developed in the metal.
3.	Because of higher deformation temperature used, the stress required for deformation is less.	The stress required to cause deformation is much higher.

PART-B (16 MARKS)

1.Classify the types of forging machines and explain any one

2.Explain the forward and back extrusion process

3. i. Classify the types of rolling mills and sketch them

   ii. List out various forging defects

4. i. Describe hydrostatic extrusion process.

   ii. Compare press forging and hammer forging

5. i. Explain the tube piercing process

   ii. Distinguish hot and cold extrusion process and briefly explain one in each.

6. i. Describe the principle of rolling. Write the various kinds of rolling mills along with their applications

   ii. What are the types of power hammers available and explain the pneumatic hammer with a neat sketch

7. i. Describe the difference between a bloom, a slab and a billet. Explain the features of different types of rolling process.

   ii. Discuss the effects of temperature, strain rate and friction on metal forming process

8. i. Explain with a sketch, what is meant by flat strip rolling.

   ii. Explain the procedure for making the head of Bolt by forging operation

9. i. Name the hand forging operation and explain briefly about them.

   ii. Explain with a neat sketch of roll forging process.

10. Describe the following processes

a. Roll die forging b. Skew rolling c. Ring rolling

Unit IV

1 Name the different sheet metals

Ans:

1.	Black iron	2.	Galvanised iron
3.	Aluminium Sheets:	4.	Copper Sheets:
5.	Stainless steel	6.	Tin platyes

2 Name the different hand tools used in sheets metals.

Ans:

1.	Hammers	2.	Mallet	3.	Swages
4.	Tongs	5.	Punches and shears	6.	Stakes
7.	Tri square and scribers	8.	Wing compass		

3 Name the commonly used tools.

Ans: In addition to all the tools some other type of commonly used tools ara as follows:

- Steel square
- Bumping hammer
- Mandrel
- Straight edge
- Chisel
- Files

4 Name the operations of sheet metal working

Ans:The main operations are as follows:

- Shearing
- Bending
- Drawing
- Forming

5 Explain Shearing

Ans: It is process of cutting a straight line across a strip, sheet or bar shearing process has three important stages;

1) Plastic deformation
2) Fracture (Crack propagation)
3) Shear

Shearing is performed either by using hand or by using machines also.

6 Explain Bending

Ans : The bending operation involves streching of metal on the outer surface and compressing it on inner surface along a neutral axis which unchanged. Sheet metal can be bent by hammering on a base by hand or by bending machines.

7 Explain drawing

Ans: Drawing operation is used to produce thin walled hollow shapes in sheet metal. It is carried out by using a die and punch on a press machine. If the drawn length is more than the width then the operation is called as **deep drawing.**

8. Explain forming

Ans: For safety purpose, the edges of the sheet metal products are formed of folded. Alse, formed edges provide stiffness to the components so that they will not retain their shapes during handling.

9. What is press working ?

Ans: Press working is a chipless manufacturing process by which various components are produced from sheet metal.

10 Why are press machines preferred?

Ans: Press machines are preffered for mass production of similar components, because for each component separate tool is required and the cost of every press tool is very high as compared to the cost of other cutting tools.

11 What is the difference between manually and power operated press?

Ans: The main difference between manually operated press and power press is that, the former moves by means of a screw and the latter by means of a crankshaft.

12 Name any 4 main parts of press.

Ans:

(a)	Base	(b)	Frame	(c)	Ram
(d)	Pitman	(e)	Clutch and flywheel	(f)	Bolster plate

13 What is clutch and flywheel?

Ans: Clutch and flywheel: Flywheel is used to store the energy, which is required to maintain the constant speed of the ram whreas, clutch is used to engage of disengage the drive shaft with the flywheel

14 Name die accessories.

Ans: Die set, Die, Die block, Punch, Lower shoe, Upper shoe, Punch plate, Back up plate, Stripper plate, Knockout.

15. Explain press operations.

Ans: Press operations may be grouped into two categories i.e. cutting operations and forming operations. In cutting operations, the workpiece is stressed beyond its ultimate strength whereas; in forming operations, the stresses are below the ultimate strength of the metal.

16 Define trimming.

Ans: It is used for cutting unwanted excess material from the perphery of a previously formed workpiece.

17 Define shaving

Ans: It is almost similar to trimming, but only small amount of material is removed during the operation as compared to trimming

18 Define lancing

Ans: In this operation, there is a cutting of the sheet metal through a small length and bending this small cut portion downwards

19 What is drawing ?

Ans: In this operation, punch forces a sheet metal blank to flow plastically into the clearance between the punch and die. Finally, the blank takes a shape of **cup**.

20: Explain embossing.

Ans: With the help of this operation, specific shapes or figures are produced on the sheet metal. It is used for decorative purposes of giving details like names, trade marks, specifications, etc, On the steel metal.

21 What is clearance?

Ans: During metal cutting, the shape of the punch is similar to die opening except that, it is smaller on each side. This difference in dimensions between die and punch(making members of a die set) is known as **clearance**.

22 How is clearance applied in blanking operation?

Ans: In blanking operation, where blank is the desired part, the die opening size is same as blank size and the punch size is obtained by subtracting the clearance from the die opening size.

23 Why is angular clearance provided?

Ans: Angular clearance is provided to enable the blank to clear the die easily and fall freely out of the die block. If the angular clearance is not provided, the punched blank would remain stuck in the die block.

24 What is tonnage capacity?

Ans: The tonnage capacity of a mechanical press is calculated by,
Tonnage capacity = Shear strength of a crankshaft material X Area of crankshaft bearings.
The tonnage capacity of a hydraulic press is calculated by ,
Tonnage capacity = Piston area X Oil pressure in the cylinder.

25 What is die space and press adjustment?

Ans: Die space: The available surface for mounting the die and punch components in the press.

Press adjustment: The distance through which the ram can be lowered below its shut height position.

26 Define penetration.

Ans: The distance which the punch enters into the stock to cause rupture is called as **penetration,** and generally it is given in terms of the percentage of the stock thickness. The percentage penetration depends on the mateial being cut and thickness of the material.

27 What is bending?

Ans: Bending is the process in which a straight length is transformed into a curved length. During bending, the outer surface of the material is in tension and inner surface is in compression.

28 Explain bend radius.

Ans: It is the radius of curvature on inside of the bend. If the bend radius is too small, then cracking of a material on the outer tensile surface takes place. To prevent any damage to punch and die, the bend radius should do not be less than 0.8mm.

29 What is drawing ?

Ans: If depth of drawn cup is upto half its diameter then the process is called as **shallow drawing** and if the depth of the drawn cup exceeds the diameter, it is callde as **deep drawing.**

30 what do you mean by shallow and deep drawing ?

Ans: If depth cup is upto half its diameter then the process is called as **shallow drawing** and if the depth of the drawn cup exceeds the diameter , it is called as **deep drawing**.

31 Define drawing force:

Ans: Drawing force:

• the force required to draw a shell is given by,

$$F = \prod d\, t\, \sigma y(D/d - C), N$$

Where ,d= Finished shell diameter, t = Blank thickness,
σy=yield Strength in tension, D = Blank diameter,
C = Constant varies between 0.6to 0.7.

32 What is strech forming?

Ans: Strech forming is used for forming smoothly contoured parts or those having double curvatures on the same curved surface out of large and thin sheets of metal.

33 Name the methods of strech forming.

Ans: Strech forming can be done by using two methods.

1) Form block method
2) Mating die method

34 Give the advantages of stretch following.

Ans: Advantages of Strech forming.

- There is no direct bending of the sheet, hence chances of cracks are reduced.
- Components can be stretched in single operation only.
- Plastic deformation is because of pure tension only.
- It is suitable for mass production.
- Cost of tooling is low.

35 Define formability.

Ans: Formability represents the response and suitability of the material for forming processes.

36 What is process of fracturing?

Ans: It states that, ductility of the metal is lower if its section size is larger.
It refers to identical metal from which specimens of different section thickness have been machined and tested.

37 Name the tests to judge the suitability of metal.

Ans: To judge the suitability of a metal and to find the temperature range for forging, various special tests have been introduced which are as follows:

1) Bend test
2) Stretch flanging test
3) Shrink flanging test

38 Name the ways on which hydro forming can be carried out ?

Ans: Hydro forming is a drawing process which can be carried out in two ways:

1) Hydro - mechanical forming
2) Electro - hydraulic forming

39 What is explosive forming and how is it classified ?

Ans : Explosive forming makes use of the pressure wave generated by an explosion in a fluid, for applying the pressure against the wall of the die. The explosives are used in the form of rod, sheet, granules, stick, liquid, etc. According to the placement of the explosive (charge) the operations are divided in two categoies:

1) Stand off operation
2) Contact operation.

40 Why is explosive forming process used?

Ans: Explosive forming process is used for the following operations:

- Blanking
- Embossing
- Coining
- Drawing
- sizing
- Expanding
- Cutting, etc.

41 Name the explosives and how are they divided?

Ans: Explosives can be solid (TNT- trinitro toluene), liquid (Nitroglycerine), or gaseous

(oxygen and acetylene mixtures).
Explosives are divided into two classes; Low Explosives in which the ammunition burns rapidly rather than exploding, hence pressure build up is not large, and High Explosives which have a high rate of reaction with a large pressure build up. Low explosives are generally used as propellants in guns and in rockets for the propelling of missiles.

42 Name the certain die materials for explosive forming.
Ans: Kirksite and plastic faced dies are employed for light forming operarions; tool steels, cast steels, and ductile iron for medium requirements.

43 What is rubber pad forming?
Ans: Rubber pad forming process is also known as **Marform process.** It is metal working process where sheet metal is pressed between a die and rubber block.

44: Give the applications of rubber pad forming. **Ans**
Applications of rubber pad forming:

- This process is used for producing flanged cylindrical and rectangular cups, spherical domes, shells with parallel or tapered walls.
- Also used for producing variety of unsymmetrical shapes.

45 What does a magnetic pulse forming consists of?
Ans: A basic magnetic pulse forming circuit consists of:

- Energy storage capacitor
- Switch
- Power supply
- Coil

46 Explain shot peening.
Ans: Shot peening process consists of throwing a blast of metal shots on to the surface of a component. The blast may be thrown either by using air pressure or by a wheel rotating at high speed. This high velocity metal blast shot provides a sort of compression over the surface of a component. This increases the strength and hardness of the surface and also its fatigue resistance.

47 Where is metal spinning used ?
Ans : Usually, spinning process is used for making cup shaped articles which are symmetrically such as pressure vessels, refinary equipments, tanks, etc.

48 : Define roll forming
Ans : Roll forming process consists of feeding a continous metal strip through a series of rolls whertby it is gradually formed into required shapes.

49 What are the operations performed on press brake?
Ans : Press brake can perform operations like bending, forming, blanking, piercing, notching, embossing, wiring, etc. by using simple dies.

PART-B (16 MARKS)

1. i. Explain any one stretch forming operation

   ii. Define formability and how it is tested?

   iii. What is drawing operation?

2.i. Explain the metal spinning operation

ii. Describe the magnetic pulse forming process

3.What is deep drawing operation? Explain with a neat sketch.

(5) i. Explain rubber pad forming process

Describe the electro hydraulic forming process

(6) i. Describe the explosive forming process

How are aluminium kitchen utensils produced?

(7) i. Describe the process of hydro forming

Describe the various methods of rubber forming. Where are these processes used?

(8) i. What is super plastic forming?

Describe the hydro forming process with the help of neat diagram

(9) i. Explain the characteristic features of sheet metal used in forming process

Explain peen forming process

(10) i. Find the total pressure, dimensions of tools to produce a washer 5cm outside dia with a 2.4 cm diameter hole, from a material 4 mm thick, having a shear strength of 360 N/mm^2

ii. Determine a) blank diameter b) Least no. drawing operations c) force and energy for the first draw with 40% reduction to produce a cup of 5 cm in diameter and 7.5cm deep to be drawn from 1.5mm thick drawing steel with a tensile strength of 315 N/mm^2

10.i. Estimate the blanking force to cut a blank 30mm and 35 mm long from a 1.5 mm thick metal strip,if the ultimate shear stress of the material is 450 N/mm^2. Also determine the work done if the percentage penetration is 25% of material thickness

ii. A blank has a perimeter of 31.75cm. The metal is 1mm thick cold worked 0.15% carbon steel with a shear strength of 420 N/mm^2 and percent penetration of 25%. Two holes of 1.25cm diameter each are to be pierced during the same stroke when the piece is blanked. What are the forces required for blanking
and for piercing?What is the maximum force the press must exert at any one time without shear?

iii. Estimate the blanking force to cut a blank 30 mm wide and 35 mm long from a 1.8mm strip if the ultimate shear stress of the material is 450 N/mm^2.Also determine the workdone if the percentage penetration is 25% of material thickness.

Unit V

1 Name the characteristic of polymer.(Any Four)

Ans : The important characteristic of polymers are

1) Light weight
2) High Corrosion resistance.
3) Low density.
4) Low thermal and electrical properties.
5) Low mechanical properties(can be improved by fibre reinforcement of plastics).

2 On what basis are polymers classified and how are they classified ?

Ans : According to mechanical response at high temperatures, polymers are classified into two major categories :

1) Thermoplastic polymers (Soften when heated and harden when cooled)
2) Thermosetting polymers (Soften when heated and permanently hardened when cooled).

3 Give the mechanism of thermosetting polymers.

Ans : These plastics are formed by condensation polymerisation. During initial heating, covalent cross-links are formed which anchor the chains together and resist the vibrational and rotational chain motions at high temperature. If heated to excessively high temperature, there occurs severance of these crosslink bonds leading to polymer degradation.

4 Differentiate thermosetting and thermoplastic polymers(Two points only)

Ans :

Sr. No.	Thermoplastics	Thermosetting
1.	They are formed by addition polymerisation	They are formed by condensation.
2.	They are linear polymers composed of chain molcules.	They are composed of three dimensional network of cross-linked molecules.

5 Where are the thermosetting polymers used?

Ans : These polymers are used in

(i) Vulcanised rubbers (ii) Epoxides
(iii) Phenolic (iv) Polyester resins
(v) Urea formaldehyde, etc.

6 Define monomer

Ans : Monomer : It is a small molecule that consists of a single unit / blocking block.

7 Define Polymer.

Ans : It is macromolecule that is formed by repeated linking of many monomers.

8 Define Homopolymer.

Ans : It is a polymer that is made up of identical monomer.

-M-M-M-M- $-M_1-M_2-M_1-M_2$

Homopolymer Copolymer

9 Define Copolymer.

Ans : It is a polymer that is made by adding different monomers.

10 Define Degree of polymerization

Ans : It is the number of repetitive units present in one molecule of a polymer.

Degree of polymerisation = $\frac{\text{Molecular weight of a polymer}}{\text{Molecular weight of a single monomer}}$

11 Define Isomerism.

Ans : It is a phenomenon where different atomic configurations are responsible for the formation of same configuration.

12 Define Oligo-polymers.

Ans : Oligo polymers or oligomers are polymers that have very short chains with molecular weight in order of 100g/mol. They are mainly liquids or gases.

13 Define High polymers.

Ans : Polymers which have a very high molecular weight ranging between 10,000 and 1,000,000 g/mol. are known as High-polymers. They are mainly solids.

14 Give the three methods of mechanism of polymerisation :

Ans : There are three general methods or mechanisms of polymerisation :

(1) Addition Polymerisation
(2) Copolymerisation
(3) Condensation polymerisation

15 Define addition polymerization.

Ans : The Polymer is produced by adding a second monomer to the first, a third monomer to this dimer and so on till the long polymer chain is terminated. This process is called as addition polymerisation.

16 Define copolymerisation and give its example.

Ans : It is the addition polymerisation of two or more different monomer forming copolymers.

Example : Styrene and butadiene combine to give a copolymer of butadiene - styrene, a rubber used in tyres.

17 Define condensation polymerisation and give its other name.

Ans : Condensation polymerisation is also known as **step-growth polymerisation**.
It is the formation of polymers by step wise intermolecular chemical reactions that normally involve atleast two different monomers.

18 Why are additives used and enlist its advantages?

Ans : Additives used to improve the properties and performance of polymers. Advantages of additives when added to the polymers are:

(i) Improve mechanical properties.
(ii) Reduce the cost.
(iii) Improve the thermal processing such as moldability.
(iv) Improve the appearance and aesthetic properties.

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(v) Improve surface and chemical characteistics of the polymers.

19 Enlist some polymer additives.

Ans : The following mentioned are the various polymer additives used in practice :

(1) Filler material (2) Plasticizers (3) Stabilizers
(4) Colorants (5) Flame retardants (6) Reinforcements
(7) Lubricants.

20 Why are fillers used?

Ans :

(1) It improves the compressive and tensile strengths of the polymer.
(2) Reduces the cost of the final product.
(3) Improvement in the thermal and dimensional properties of the polymers.

21 Why are plasticizers used?

Ans :

(1) They improve the ductility, flexibility and toughness of the polymer.
(2) Hardness and stiffness are reduced.
(3) During moulding, plasticizers control the flow of the polymer.

22 Why are stabilizers used?

Ans :

(1) They prevent deterioration of polymer due to environmental effects.
(2) Also prevent deterioration due to ultraviolet radiation .
(3) Help to extend the life of the finished product.

23 Name the methods of processing thermoplastics.

Ans : Thermoplastics can be processed to their final size and shape with the help of following processes:

(1) Injection moulding (plunger and screw type) (2) Rotational moulding
(3) Blow moulding (4) Film blowing
(5) Sheet forming process.

24 Give the types of injection moulding.

Ans :

(1) Ram or Plunger type Injection Moulding
(2) Screw type Injection Moulding

25 What are the applications of injection moulding?

Ans : Typical parts produced by this process are cups, chairs, toys, containers, knobs, automobile parts (car dash-board, car handles, etc), air conditioner parts, plumbing fittings, electrical fittings, etc. This process is used for making components which consists of complex threads. Production of intricate shapes and thin walled parts like radiator fan can be done by this process.

26 Enlist the types of blow moulding.

Ans : There are various types of blow moulding process which are as follows :

(1) Injection blow moulding

(2) Extrusion blow moulding

(3)Multi-larger blow moulding

27 Where is blow moulding used ?

Ans;

1. Blow moulding process is mainly used for making cosmetic packaging, food and water bottles, pipes, floats, toys, doll bodies and many other articles.
2. It is also used for making hollow containers, automobile fuel tanks, boat fenders, heater ducts and hollow industrial parts like drum.

28 Explain film blowing

Ans : In this process, a thin walled tube is extruded vertically as shown in fig. 5. 6 and expanded into a balloon like shape by blowing air through the centre of extrusion die until the desired film thickness is obtained.

29 What is the difference between rolling and calendering?

ANS: The main difference between rolling and calendering is that, in calendering there is appreciable thickening after the material has reached minimum thickness at the roll gap and the pre-calendered material is not in the sheet form.

30 Give the application of calendering?

ANS: (1) Vinyl, polyethylene, cellulose acetate films, shower curtain, tapes, trays, ATM cards , lamination, and transparent films used for packaging.

(2) It is also used for production of rainwear, shower curtains, tapes, ATM cards, laminations and transparent film used for packaging.

31 Define extrusion moulding .

Ans: Extrusion process is a continuous process in which the hot plasticized material forced through the die opening of required shape.

32 Name the three sections of screw.

Ans: The screw have three different sections which are as follows

(1) Feed section (2) Transition or melting section

(3) Pumping section

33 Write the applications of extrusion moulding.

Ans:

(1) The extrusion moulding process is used for producing solid rods, pipes or tubes of U, J, Y or other sections.

(2) Also used for extrusion of candy canes, chewing gums, drinking straws, plumbing pipes, door insulation seals, optical fibers, plastic coated wires, window frames, sheets, strips for electrical applications, etc.

34 Explain thermoforming.

Ans: It is a series of processes for forming thermoplastic sheet or film over a mould with the application of heat and pressure.

35 List the advantages of thermoforming.

Ans: Advantages fo Thermoforming:

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- Initial set-up cost is low.
- Time required for set-up is low.
- Production cost is low.
- During the process less thermal stresses are produced.
- Intricate shapes are easily formed.

36 From what process are small jelly containers used in restaurants, luggage bags, refrigerator inner panels made? And define it.

Ans: Thermoforming process.

It is a series of processes for forming thermoplastic sheet or film over a mould with the application of heat and pressure.

37 What are the processes used for thermosetting plastics?

Ans: For processing of thermosetting plastics following processes are most commonly used:

(1) Compression moulding and
(2) Transfer moulding

38 What are the factors of a successful compression moulding?

Ans: Following are the four primary factors in a successful compression moulding process:

- Quanity of material
- Heating time and technique
- Force applied to the mould
- Cooling time and technique

39 Give the application of compression moulding.

Ans :

(1) Compression moulding is used for making flatwares, gear, buttons, buckles, knobs, handles, dishes, container taps and fittings

(2)Also used for moulding of electrical and electronic components, washing machine agitators and housings.

40 What is gate moulding?

Ans: This is the process of forming articles in a closed mould, where the fluid plastic material is conveyed into the mould cavity under pressure from outside of the mould.

41 What does laminated plastics consists of and write its principal ?

Ans : Laminated plastics consists of sheets of paper, fabric, wood asbestos, cellulose or other similar materials that are coated with resin.

Laminated process is based on the principal of layers of sheets like metal foil, paper, etc. bonded together in a stack.

42 How is laminated plastic classified ?

Ans : Lamination process is classified in two categories :

- High pressure laminates
- Low pressure laminates

43 What are the pressures used is low and high pressure lamination?

ANS:

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Low pressure laminates:

- In this process, pressures upto 28MPa are applied.

High pressure laminates:

The pressure generally ranges from 8MPa to 24MPa.

44 Name the processing methods of plastics?

ANS:

(1) Plug and ring forming (2)pressure forming
(3)Draw forming (4)reaction injection moulding (RIM)
(5)Drape forming

45 Define pressure forming?

ANS: In this method, the heated plastics sheet is formed into the required shape between a pair of male and female dies . In this process vacuum is not used.

46 What is draw forming?

ANS: This process is similar to deep drawing process for metal. A heated blank of plastics sheet is plated over a die and held firmly by holding plates. A punch is pressed down into the die cavity to the material into the die and around its own body.

47 Explain the drape forming?

ANS: It is the simplest of all methods of forming. It consists of draping the heated plastics sheet over the contours of a male form, followed **by** pressure and cooling.

48 Define reaction injection moulding?

ANS: RIM is the different forms the conventional injection moulding process as the molten polymer is not injected into a mould but a mixture of two or more monomers (reactants) are forced into a mould cavity. The chemical reaction takes places between the mixture and the heat is generated . This generated heat is used to form a plastics polymer that solidifies and produces thermost components.

PART – B (16 MARKS)

1. Explain the principle of injection moulding process

2 .i. Describe any method of bonding thermoplastics

ii. What is laminating? Explain the low pressure method of laminating

3. i.Explain the transfer moulding process

ii. Why screw injection moulding machine is better than a ram type injection moulding machine?

4. i.Describe the compression moulding process

ii. Describe briefly any two thermoplastics and thermosetting plastics

5. What are the process used for processing of thermoplastic. Explain any one process with suitable

sketches

6. What is thermoforming process. Explain with a neat sketch
7. Describe film blowing operation
8. Explain Rotational moulding
9. i. Explain blow moulding process with its salient features

   ii. What are the additives to be mixed in processing plastics and explain the purpose of each.

10. i. Describe different types of plastics with applications of each type

    How do thermoplastics differ from thermosetting plastics?