**DHANALAKSHMI SRINIVASAN COLLEGE OF ENGINEERING AND TECHNOLOGY**

**Mamallapuram, Chennai-603104.**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**QUESTION BANK**



# Subject Code: ME8351 Year / Semester: II / III

# Subject Name: Manufacturing Technology -I

# UNIT- I METAL CASTING PROCESSES PART-A

**1.Define Pattern & List the material used for pattern. (APRIL/MAY 2018)**

Pattern is a model of casting. Used for making cavites in the mould. In these cavities the molten metal is poured to produce a casting. Materials: Wood, Metal, Plaster, Plastic, Wax. **2.State the different types of Pattern. (APRIL/MAY 2015, Nov/Dec 2019)**

Double piece Pattern, Match Plate, Loose Piece Pattern, Sweep Pattern, Segmental, Skeleton, Shell Pattern.

# What are the factors for selecting the pattern materials?

(i) Number of casting to be produced (ii) Quality of casting

(iii) Size & shape of the casting. (iv) Required surface finish.

# What is pattern allowance?

Patterns are not made to the required casting size. They are made slightly larger than or smaller than the required casting. This extra dimension given to the pattern is called pattern allowance.

# What are the types of pattern allowance?

Machining allowance, Distortion allowance, Rapping Allowance, Draft Allowance.

1. **Make a note on shrinkage allowance.**(April/May 2019)

The metal will undergo shrinkage during solidification and contract further on cooling to room temperature. To compensate this, the pattern is made larger than the required casting. This extra size is given on the pattern for metal shrinkage is called shrinkage allowance

1. **Write any two advantages of Sand casting.** .(April/May 2019) Sand casting's main advantages as a casting process include:
   1. Relatively inexpensive production costs, especially in low-volume runs.
   2. Capacity for casting both ferrous and non-ferrous materials.
   3. A low cost for post-casting tooling.

# List the types of Moulding tools.

Shovel, Trowel, Slick, Bellows, Riddle, Rammer, Strike off Bar, Runner & Riser, Mallet, Gate cutter, Vent Rod, Lifter.

# What are the ingredients of Moulding Sand?

* 1. Sand ii. Binder- Clay type, Organic, Inorganic iii.Additives-Reducing Agents, Fibrous, special additives.

# Classify the Moulding sand.

(i) Natural Sand (ii) Synthetic Sand (iii) Special sand.

# What are the properties of Moulding Sand?

Porosity, Plasticity, Adhesiveness, Cohesiveness, Refractories, Collapsibility.

1. **What are the steps for preparing the Moulding sand ?** (i)Mixing of Sand-mixed with binder,moisture and other additives (ii)Tempering of sand-mixing of adequate amout of water

(iii)Conditioning of sand-Removing foreign materials,binder distribution delivering at proper temperature.

# What are the types of Moulding Sand?

Green Sand, Dry sand, Loam Sand, Facing Sand, Parting sand, Core Sand.

# What are the components of Gating system?

Poring cup, Spure, Runner, Gate, Riser.

# What are the types of Moulding methods?

Green Sand Moulding, Dry Sand Moulding, Loam Moulding, Bench Moulding, Floor Moulding, Pit Moulding, Sweep Moulding, Plate moulding, Machine Moulding( Jolt Machine, Sand Slinger, Top & Bottom Squeezer.

# What is meant by Core & Core print? (NOV/DEC 2012) (APRIL/MAY 2015) (NOV/DEC 2015) (NOV/DEC 2018, NOV/DEC 2019)

Core: It is used to make a hollow type casting. The core is placed in the mould and is removed after casting.

Core Print: A projection made in the pattern is called core print. It is used to form a core seat in the mould.

# What are the types of core boxes?

Half Core box, Dump core box, Split core Box, Strickle core box, Gang Core Box.

# What are core binders?

Binders are added with the core sand to bind the sand grain together. It give the strength and hardness to the core. Also it prevents moisture absorption.

Types: (i) Oil Binders (Linseed Oil ) (ii) Water Soluble Binders: Starch, dextrin. (iii)Resin Binders: Phenol Formaldehyde, Urea.

# What are the types Core Ovens?

(i) Batch Type Oven (ii) Continuous Type Ovens (iii) Di –Electric Baking Ovens.

# What are the different types of casting process?

(i) Sand Casting (ii) Gravity die casting (iii) Pressure Die casting-Hot & Cold Chamber

(iv) Centrifugal- Centrifuge, semi centrifuge (v) Continuous (vi) Chilled casting

# What are Chaplet? (APRIL/MAY 2016)

Chaplet provide sufficient support for the core in the mould being poured if the cores are bigger in size. In such cases, the core is supported with rigid metal piece called Chaplets.

# What are the different types of Melting Furnace? (NOV/DEC 2012)

(i) Cupola Furnace (ii) Crucible Furnace- Pit type, coke fired stationery furnace, Oil fired Tilting Furnace (iii) Electric Arc Furnace- Direct arc, Indirect, Induction Furnace.

# Define Fettling of casting.

Fettling is the process of Cleaning castings to avoid defects. Trimming, Surface cleaning Example: The molten metal enters the mould cavity by the runner, sprue and ingate. After solidification these parts are attached with the casting. Removing these process is knows as fettling.

# List the defects casting.

Blow holes, Slabs, Honey combing, Shift, Cold shut, Fins, Run out, Rat Tail, Swell ,Blister.

1. **List the Instruments used for measuring temperature in molten metal**. Thermo electric Pyrometer, Optical Pyrometer.

# What is meant by grain fineness number?

Grain fineness number is a ratio between Total products and Total percentages of sand retained on pan and each sieve. This system was developed by AFS (American Fineness Society) for rapidly expressing the average grain size of given sand.

# Mention few applications of centrifugal casting

Pipes, Tubes, bushings, pulleys, nozzles and rings can be manufactured with the centrifugal casting process.

# What is the ideal profile of sprue? (NOV/DEC 2015)

It has taper, square, rectangular or circular shape.

# What are the causes of misruns in casting? (APRIL/MAY 2016)

It is due to low pouring temperature, too small gate, faulty moulding and faulty moulding box equipment. (misrun-incomplete filling of the mould cavity at one pouring)

# What are the characteristics of a core? ((NOV/DEC 2016)

1. Refractoriness- with stand high temperature
2. Permeability- allow steam and gases to pass though it
3. Collapsibility- capable of collapsing shortly after the molten metal has solidified Also it must have good Strength and stability.

# Name the alloys which are generally die cast. Why are aluminium alloys preferably cast in cold chamber die casting machines? (NOV/DEC 2016)

Zinc alloys, Aluminium alloys , Magnesium alloys & Copper alloys are generally die cast. Cold chamber die casting is more suitable for metals with high melting points and corrosive properties such as aluminum. So, cold chamber die casing is perfered for aluminium alloys.

# What is meant by permanent mould casting? (April / May 2017)

Permanent mould casting is a metal casting process. That employs reusable moulds. Usually made from metal. Some of the commonly used casting metals are aluninium, magnesium,tin and lead alloys.

# What is the cause of the casting defect called hot tear? (April / May 2017)

Hot tears, also known as hot cracking, are failures in the casting that occur as the casting caused by the residual stresses. Proper mold design prevents this type of defect.

# What is natural sand moulding? Give its constituents. (Nov /Dec 2017)

Natural molding sands contains sufficient amount of binder material. The constituents of natural sand i) Binder- Clay type, Organic, Inorganic ii) Additives-Reducing Agents, Fibrous, special additives. iii) moisture.

# What are hot spots and hot tears? (Nov /Dec 2017)

Hot spots in casting are regions which become thermally isolated. These regions are solidified at last and leaving shrinkage porosity in casting. Hot tears, also known as hot cracking, are failures in the casting that occur as the casting caused by the residual stresses.

# What are the advantages of investment casting. (APRIL/MAY 2018)

* Provide very good surface finish.
* Impart high accuracy to castings.
* Free from defects
* surface finish is very high.

1. **Write a note on loam sand.**

Loam is mixture of sand and clay with water to a thin plastic paste. Loam sand possesses high clay as much as 30-50% and 18% water. Loam sand becomes hard when it is dried.

This is particularly employed for loam molding used for large grey iron castings such as bell, pulley.

1. **What is cohesiveness and explain briefly? (NOV/ DEC 2020)**

The ability of sand particles to stick together is denoted as cohesiveness or the strength of moulding sand. Due to this property, mould retains its shape even after the molten metal is poured in the mould. Cohesiveness property is largely effected by the clay and moisture content, and size of grains.

1. Make a note on CO2 moulding. **(NOV/ DEC 2020)**

The core sand is mixed with sodium silicate binder. Also additives like wood flour or graphite may be added with the core sand. The mixture is thoroughly mixed in sand muller. The core sand is filled up in the core box and rammed. Then CO2 gas is passed through the core for 30 seconds at a pressure of 1.5Kg/cm2. CO2 reacts with sodium silicate to form a silica gel. As this silica gel is very hard,the core becomes hard.Now the core can be used immediately.

# PART-B (C304.1)

1. (a) What are the pattern allowances? Explain briefly each. (NOV/DEC 2012) (08)
   1. Discuss the properties of moulding sand. (08)
2. (a) Explain the CO2 process of core making state its advantages and applications. (Nov/Dec 2018) (Nov/Dec 2019) (08)
   1. What are the different types of pattern materials and Explain with its merits and Demerits. (NOV/DEC 2016) (08)
3. (a) Explain the different type of moulding machines with neat sketch. (08)
   1. Explain the different types of pattern with neat sketch. Describe any two types with sketches and state the uses of each of them.NOV/DEC 2016) (07)
4. What is the importance of allowance considered on pattern? Explain.

(Nov/Dec 2019) (07)

1. (a) With a neat sketch of a cupola explain the different types of its Zones.

(NOV/DEC 2015,2017) (13)

* 1. With a neat sketch explain the Moulding tools with their uses. (08)

1. (a) Explain the types of centrifugal casting. (APRIL/MAY 2015) (08)
   1. What are the different types of electric arc furnace with neat sketch. (08)
2. (a) Explain briefly about Shell moulding method in foundries with merits and demerits. (NOV/DEC 2015) (APRIL/MAY 2018) (13), (NOV/DEC 2019) (15)
   1. Explain the types of Pressure die casting process with neat sketch. (08)
3. Explain the different types of Sand testing with neat sketch. (13)
4. Explain the different types inspection methods used in foundries. (13)
5. (a) Explain Investment casting with neat sketch.(APRIL/MAY 2017) (08)
   1. Discuss about the defects, causes, remedies in casting process. (APRIL/MAY 2015),(NOV/DEC 2016),(NOV/DEC 2015), (APRIL/MAY 2018) (07)
6. Explain crucible(Oil fired,coke fired) furnace with neat sketch. (13)
7. (a) Explain ceramic mould casting. (08)
   1. Explain the different types of core used in foundry. (08)
8. Explain the casting defects indicating their causes and remedies . (08)
9. Explain various properties required for moulding sand.(APRIL/MAY 2015) (08)
10. Describe the constructional feature of cupola furnace (08)
11. Explain the various steps involved in sand core manufacturing. (13)
12. With neat sketches, explain the sand casting process. (APRIL/MAY 2017) (13)
13. Name any two casting defects and its remedies of the following categories

i) Metallic Projection ii) Cavities iii) Defective surfaces. (NOV/DEC2017) (13)

1. Describe the stepwise procedure of making a mould with two piece split pattern. (13)
2. Explain the different moulding sand. (APRIL/MAY 2018) (06)
3. Why are steel more difficult to cast than cast irons? (APRIL/MAY 2016) (06)
4. What are the operations required in sand casting after the casting is removed from the mould? Write briefly about any two of them. (APRIL/MAY 2016) (10)
5. Sketch hot-chamber die casting machine. Explain with its application. (NOV/DEC 2018,April/May 2019) (13)
6. With neat diagrams explain the process of cold chamber die casting operations. (APRIL/MAY 2016). (12)
7. Explain the process of centrifugal casting with suitable sketch and state its specific applications. (APRIL/MAY 2016)
8. Enumerate about CO2 moulding. (NOV/DEC 2018) (13)
9. Explain with neat sketch stir Casting with process parameters. (April/May 2019) (13)
10. How the size of the silica is identified? Explain with suitable example.(Nov/Dec 2019) (7)
11. Explain the working of sand slinger machine. (Nov/Dec 2019) (6)
12. Discuss on different types of pattern used in mould making for sand casting process. Nov/Dec 2020) (13)
13. Explain with neat sketches steps involved in Lost wax casting process.(Nov/Dec 2020) (13)

# PART- C

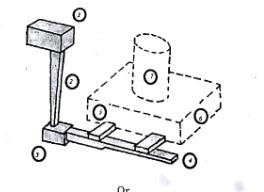
1. Which casting method is most suitable to manufacture small parts and [jeweller](https://en.wikipedia.org/wiki/Jewellery)y? Explain it in detail.
2. Which manufacturing process doesn’t required core to prepare the hollow components?
3. A casting is required to have the following composition: C-3.25%, Si-1.8%, Mn- 0.6%, P-0.5% and S-0.1%. Determine the weight of pig iron from pile A and pile B to be picked up in each metal charge if the charge (200kg) is to contain pig iron-50%, foundry return -40% and purchased scrap- 10%. Analysis of these metals is as follows. (NOV/DEC 2016)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Metal | Si% | Mn% | S% | P% |
| Pig iron(pile A) | 2.4 | 0.9 | 0.05 | 0.4 |
| Pig iron (pile B) | 1.4 | 0.95 | 0.05 | 0.35 |
| Foundry returns | 1.7 | 0.6 | 0.06 | 0.3 |
| Purchased scrap | 2.2 | 0.7 | 0.07 | 0.25 |

1. Explain the design considerations to be followed when designing a part for the casting process.
2. Explain the requirement for the pattern material. Discuss the suitability of following materials: Wood, Aluminium, rubber, brass and White metal. (NOV/DEC 2018)
3. Enumerate the step by step procedure involved in shell molding process.Stae its

advantages and disadvantages.(Nov/Dec 2019)

1. Identify the elements of gating system and explain their role in the casting output. (April/May 2019)



1. Discuss about suitable casting techniques used for Aluminum alloy parts.(NOV/DEC 2020) (13)

# UNIT II - JOINING PROCESSES PART-A (C304.2)

* 1. **How C2 H2 is preserved in the cylinders? (Nov/Dec 2019)**

To stabilise the gas against decomposition, acetylene is never stored in a pure state. Instead it is mixed with a liquid solvent (usually acetone) and stored in a special cylinder which contains a porous filler material with valve protection cap. (also known as a porous mass).

# Define welding.(April/May2019)

Welding is an operation whereby two or more parts are united by means of heat or pressure or both. It is usually used on metals and thermoplastics.

# Make a note on soldering. (April/May2019)

Soldering is a joining process used to join different types of metals together. Solder is metal alloy usually made of tin and lead which is melted using a hot iron.

# List the arc welding equipments.

Arc Welding Equipments,Earthing clamp,Welding generator(D.C),Protective shield Welding transformer (A.C), Gloves, Electrode holder, Apron, Cable, Wire brush.

# Sate the different types of electrode used in welding.

Electrodes are mainly classified into two types. They are Consumable electrode and Non consumable electrode. Consumable is not only used to produce the arc, also provide filler

material during welding. Non consumable electrodes are made of carbon, tungsten which do not consume during welding.

# State the equation of heat generated in Resistance welding.

Heat generation in weld may be expressed. Q = I2 R T

Q – Heat I - Current in amps. R – Resistance of assembly. T – Time of current flow.

# Define soldering & Brazing. (APRIL/MAY 2015)

*Brazing* It is the process of joining similar or dissimilar metals by using a high melting alloy called as spelter. Spelter is a mixture of copper and zinc alloy.The melting temperature of spelter is about 6000 C.

*Soldering* It is the process of joining two similar or dissimilar joint by low melting alloy called as solder.Solder is alloy of tin and lead. It melts at low temperature 1500 to 3500C. The edges are not melting in this method. Here a flux like zinc chloride is applied at the edges to prevent oxidation.

# State the specification and choice of electrode. (APRIL/MAY 2018)

Electrode are specified by length and diameter available up to 12mm diameter and 450mm long and electrode depends on type of parent metal.

|  |  |  |
| --- | --- | --- |
| S.No | WORK PIECE | ELECTRODE |
| 1. | Wrought Iron | Low carbon steel rod |
| 2. | Cast Iron | Cast iron rods |
| 3. | Mild steel | M.s copper coated rod |
| 4. | Alloy steel | Low- alloy steel of 0.25% carbon |
| 5. | Aluminium | Cast aluminium alloy rod |
| 6. | Carbon steel | Steel wire of 0.1% to 0.18% carbon and 0.0025 to 0.04%  phosphor and sulphur. |

# State the application of thermit welding.

Repairing heavy parts ,Broken teeth of large gears, welding of pipes, shaft , cable, Conductors.

# List the purpose of flux used in welding. (APRIL/MAY 2016, Nov/Dec 2019)

Flux coating is meant for (i) To produce a gas shield around the arc and molten metal due to this atmospheric reaction is restricted, (ii) To increase strength of weld, (iii) Increase deposition efficiency.

# Why shielding of weld area in welding is required? (NOV/DEC 2015) (NOV/DEC 2018)

The purpose is to protect the weld area from oxygen and water vapour. Oxidizing will form the rust inside the weld area. So it will reduce the strength.

* 1. **What are the different types of Flames used in Gas Welding?** Neutral Flame- Welding of steel , Cast Iron, Aluminium, Copper, Carburising- Welding of alloy steels,Nickel and Monel Metal, Oxidising Flame- Welding of Brass,Bronze,Maganese and steel.

# Define solid State Welding.

It is the process of joining metals in solid state without melting them.Joining is done by the interatomic bonds developed when the atoms of two surfaces are brought very close to each other.

# Name the different types of test used for welding?

Non- Destructive Test – Magnetic Particle Test,Xray ,Ultrasonic Test Destructive Test- Nick Brake Test, Bend Test, Tensile test.

# List the equipments used in gas welding.

1. Gas cylinders.(ii) Pressure regulators(iii) Pressure gauges.(iv) Hoses(v) Welding torch.

# State the defects in welding.

Incomplete Fusion, Slag Inclusion, Porosity and blow holes, Crack, Undercut, Lamellar tearing.

# What do you mean by TIG Welding?

Tungsten Inert gas Welding utilize Non consumable Tungsten Electrode. It produce only electric arc. It cannot be act as a filler metal. An inert gas like argon or Helium used Through the nozzle.

# What is meant by rightward and leftward welding techniques?

Right ward technique: Welding is carried out from left to right. It has no lateral movement.The blow pipe angle should be 40 to 500 C.

Leftward Technique: Welding is carried out from right to leftt.It has lateral movement on sideways.The blow pipe angle should be 30 to 400 C.

# What do you mean by electro slag welding?

In this welding process, the heat is generated by an electric current passing between consumable electrode and workpiece through a molten slag convering the weld surface. In this process, the coalescence is formed by molten slag and the molten metal pool remains shielded by molten slag.

# How does the seam welding is an application of spot welding?(NOV/DEC 2015)

It is type of resistance welding process inwhich the weld is made continuously between overlapping Sheet metals

# Define Arc crater.

Arc crater is depression in the molten metal created by the end of the welding electrode during the welding of metal.

# Compare Arc and GAS Welding.

Arc welding: Heat is obtained from electric arc 4000°C, Electrode is used a filler rod, strength of the joint is more, filler metal should be same as work material.

Gas welding: Heat is obtained from Gas flame 2300°C, Seperate filler metal is used, strength of the joint is less, filler metal and work metal need not be same.

# What is meant by “Carburising flame” in gas welding? (NOV/DEC 2012)

A carburizing flame is also called redcuing flame which is obtained by supplying more acetylene than oxygen. This flame has three zones- sharp inner zone, white intermediate cone, bluish outer cone. This flame is used for welding high carbon steel , HSS, cemented carbides etc.

* 1. **What is the principle of Thermit welding? (NOV/DEC 2012) (APRIL/MAY 2018)** Thermit welding is a chemically reaction welding process. The weld joint is produced by pouring of superheated molten metal around the joint to be welded, applying with or without of pressure. Thermit welding basically called a mixture of finely divided metal oxide and a metal reducing agent as aluminium.

# What is meant by nugget in electric resistance welding? (NOV/DEC 2014)

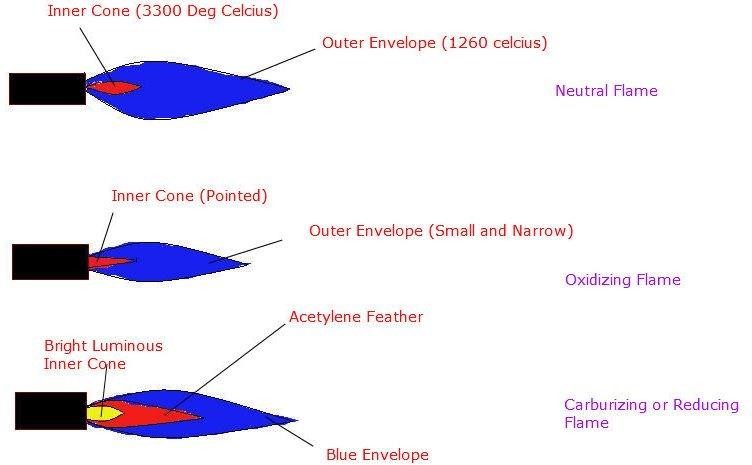
In order to obtain a strong bond in the weld nugget, pressure is applied until the current is turned off and the weld has solidified. Accurate control and timing of the alternating electric current and of the pressure are essential in resistance welding. The weld nugget is generally 6 to 10 mm in diameter

# What is the difference between soldering and brazing? (NOV/DEC 2014)

Brazing is done using a high melting alloy called spelter (mixture of copper and zinc) whereas soldering is done using a low melting alloy called solder( tin and lead).

Melting temperature of brazing is about 6000C whereas for soldering its about 1500C

# Sketch different types of oxy acetylene flames? (NOV/DEC 2014)



* 1. **Why is spot welding commonly used in automotive bodies and in large appliances? (APRIL/MAY 2016)**

Spot welding is used to make lab joints. Metal sheets from 0.025mm to 1.25mm thickness can be easily joint by spot welding. Automation of spot welding improves the production rate of automotive bodies.

# What is the role of flux in welding operation? (APRIL/MAY 2016)

Flux coating is meant for (i) To produce a gas shield around the arcand molten metal due to this atmosphric reaction is restricted, To increase strength of weld, Increase deposition efficiency.

# Why do residual stresses get developed in weldments? (NOV/DEC 2016)

Residual stresses in welded joints are primarily developed due to differential weld thermal cycle (heating,peak temperature and cooling at the any moment during welding) experienced by the weld metal and region closed to fusion boundary.

# Why the temperature in plasma is welding is much higher than in other arc welding process? (NOV/DEC 2016)

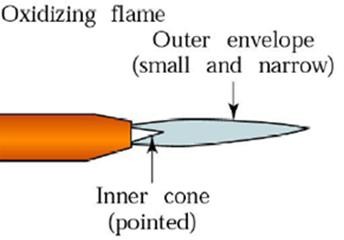
Plasma energy is higher because it is Concentration is restricted in diameter, thus concentrating the energy in to a smaller area, resulting in much higher power. So it increases the pressure, temperature and heat transfer.

# What are the two types of Plasma arc welding? (APRIL/MAY 2017)

* + - TRANSFERRED TYPE: The tungsten electrode is connected to the negative terminal of W/P is connected to positive terminal.
    - NON- TRANSFERRED TYPE: Power is directly connected with the electrode and torch of nozzle.

# Sketch an Oxidizing flame in Oxy acetylene gas welding. (APRIL/MAY 2017)

Here flame has excess of oxygen over that required for a neutral flame. O2:C2H2 = 1.5 to 1.15.



* 1. **How does penetration vary for DCSP and DCRP welding? (NOV /DEC 2017)** Direct Current Straight Polarity (DCSP), in DCRP base plate is made negative so higher heat is generated at the tip of the electrode. Due to lack of heat, DCRP may result in incomplete fusion and lack of penetration.

# Define the terms weld decay and dilution. (NOV /DEC 2017)

Weld [decay](http://www.corrosionclinic.com/different_types_of_corrosion.htm) is a form of intergranular corrosion, usually of stainless steels or certa in nickel- base alloys, that occurs as the result of sensitization in the heat-affected zone during the welding operation.

The dilution in welding terms is defined as the weight of the base metal melted divided by the total weight of the weld metal. For example, a dilution of 0.40, gives the fraction of the weld metal that came from the consumable electrode is 0.60.

* 1. **What is the difference between brazing and braze welding.**

It is the process of joining similar or dissimilar metals by using a high melting alloy called as spelter. Spelter is a mixture of copper and zinc alloy. The melting temperature of spelter is about 6000 C.

Braze welding is similar to torch brazing, except that joint openings may be wider and the distribution of filler metal takes place by deposition rather than by capillary flow.

Equipment and some filler metals used in braze welding are the same as those used in torch brazing.

* 1. What is the minimum distance should be maintained between two successive resistance spot welds ? Why ? (NOV/DEC 2020)

It is recommended that distance between two spot welds should be a minimum of 10 times the material thickness. Recommended spacing between two spot welds should be followed to achieve good strength, stiffness and energy absorption. Distance between two spot welds depends on the sheet thickness and material. Narrow spacing between two consecutive spot welds should be avoided to achieve good weld strength.

* 1. **What are causes and remedy for weld porosity ?** (NOV/DEC 2020) Causes:

1. Rust, oil, paint or moisture on the joint surface
2. Too little shielding gas
3. Strong wind
4. Too much welding amperes,arc length or arc voltage. Remedies:
5. Cleaning the surface joint.
6. Using appropriate welding amperes,arc length or arc voltage.
7. Using proper amount of shielding gas.

# PART-B (C304.2)

1. What are the difference between friction and friction stir welding? (Nov/Dec2019) (6)
2. What are the different types of welding techniques used in gas welding process? Explain (Nov/Dec2019) (6)
3. Explain with neat sketch plasma arc welding process.(April/May 2019) (13)
4. Sketch and explain fusion welding process. (April/May 2019) (13) 5.Explain the principle used in arc welding and explain the equipments used in arc (08) 6.(a)Explain submerged arc welding with sketch. (APRIL/MAY2015) (08)

(b) Explain the flame characteristics in gas welding with sketch and its applications.(08)

1. Explain the gas welding equipments with neat sketch. (APRIL/MAY 2016) (13)
2. Write short notes on Friction welding , Electron beam Welding with neat sketches. (NOV/DEC 2016) (13)
3. Explain thermit welding with neat sketch. (NOV/DEC 2017) (08)
4. Explain Spot Welding with neat sketch.( NOV/DEC 2019) (07)
5. Discuss about soldering & Brazing with neat sketch. (08)
6. Discuss about weld defects and the testing methods in welding. (NOV/DEC 2012)(13) (APRIL/MAY 2017) (05) (April/May 2019) (Nov/Dec 2019) (13)
7. Explain Seam, spot,Butt welding with neat skecth. (13)
8. (a) Explain pecussion welding & Oxy acetylene welding with neat sketch. (08)

(b) Discuss about Adhesive bonding Techniques & Fillers and fluxes in welding. (08)

1. Explain the metal arc welding process with a sketch. (NOV/DEC 2012) (08)
2. Explain with neat sketch the components of oxy acetylene gas welding equipment. (NOV/DEC 2015) (08)
3. Describe the process of Electro slag welding and identify the applications (08)
4. Explain the process of rotary drive friction welding with advantages and limitations (08)
5. Briefly explain the principle of operation, advantages and limitations of electron beam welding.(APRIL/MAY 2018) (13)
6. Explain the principle of arc welding. What are the different weld positions in arc welding? Ennumerate some defects due to arc welding (APRIL/MAY 2015) (13)
7. Explain the principle of resistance welding. What are the different types of resistance welding and explain any one of them with neat sketch.(NOV/DEC 2015) (13)
8. Describe the ultrasonic welding process with diagram. (APRIL/MAY 2015) (08)
9. What are the advantages and disadvantages of welding compared to other types of assembly operations? (12). What is the principle of resistance welding process? (APRIL/MAY 2016) (04)
10. Explain the neat sketch of gas metal arc welding (NOV /DEC 2018) (13)
11. What is a soldering flux? What different types of soldering fluxed are used? (NOV/DEC 2016). (05)
12. Explain the principle and equipment of Gas Tungsten arc welding process with neat sketches. (APRIL/MAY 2017, 2018) (13) ( NOV/DEC 2019) (07)
13. What are functions and names of sheilding gases used in TIG and MIG? (NOV /DEC 2017) (05)
14. What is explosive welding? Describe its principle, process parameters and applications. (NOV /DEC 2017)
15. Explain principle and two types of friction welding process. (NOV/DEC 2018) (13)
16. Explain about three types of flames used in gas welding and their applications.

( NOV/DEC 2020) (13)

1. Elucidate process parameters of friction stir welding and their control.

(NOV/DEC 2020) (13)

# PART - C (C304.2)

1. Name and describe any one of the methods of joining dissimilar materials having different coefficient of thermal expansion. (NOV/DEC 2017) (15)
2. Identify the welding process which is using a non consumable electrode with clear sketch and explanation.
3. Identify a joining process which is used in railway track joining with clear sketches.
4. In which welding process the big plates can be welded Identify it and explain it clearly sketch. (15)

# UNIT III-METAL FORMING PROCESSES PART A (C304.3)

1. **What are the four major drawbacks of hot working?** (Nov/Dec 2019)

As hot working is carried out at high temperatures, a rapid oxidation or scale formation takes place on the metal surface which leads to poor surface finish and loss of metal.

* + Due to the loss of carbon from the surface of the steel piece being worked, the surface layer loses its strength.
  + This weakening of the surface layer may give rise to fatigue crack which results in failure of the part.
  + Close tolerance cannot be obtained.
  + Hot working involves excessive expenditure on account of high tooling cost.

# Classify the types of extrusion.

1. Hot Extrusion- direct and indirect types 2.Cold Extrusion- impact type

# Why are a number of passes required to roll a steel bar?

To reduce the thickness and to increase the width of the bar number of passes are required.

1. **What is the difference between a bloom and a billet?** (Nov/Dec 2019)

A bloom has a square cross section with minimum size of 150x150 mm and a billet is smaller than bloom and it may have any square section from 38 mm upto the size of a bloom.

# What is impact extrusion ?

The raw material is in slug form which have been turned from a bar or punched from a strip. By using punch and dies, the operation is performed. The slug is placed in the die and struck from top by the punch opareting at high pressure and speed.

# How are seamless tubes produced?

Seamless tubing is a popular and economical raw stock for machining because it saves drilling and boring of parts. The piercing machine consists of two rapered rolls, called as piercing rolls.

# What is Sejournet process?

That extrusion process which is based both on the use of a lubricant in a viscous condition at extrusion temperature and on a separation between the lubrication of the chamber wall and die is called Sejournet process.

# What is skew rolling ?

Skew rolling is a metal forging process that uses two specially designed opposing rolls, that rotate continuosly. Round stock is fed into the rolls, the material is forged by each of th grooves in the rolls and it forms a metal ball.

# What are the disadvantages of forging processes?

Complicated shapes cannot be produced.

* + Generally used for large parts.
  + Because of cost of dies, process is costly.

# Define cold and hot working in short.

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.

# Explain the term extrusion process. (or) What do you mean by lateral extrusion? (NOV/DEC 2015)

The extrusion process consists of compressing a metal inside a chamber to force it out through a small opening which is called as die. Any plastic material can be successfully

extruded. A large number of extruded shapes which are commonly used are tubes, rods, structural shapes and lead covered cables. During the process, a heated cylindrical billet is placed in the container and forced out through a steel die with the help of a ram or plunger.

# What is the purpose of rolling ?

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.

# Name the commonly used rolled sections.

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

# What are the factors affecting choice of extrusion?

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 type, etc. |  |  |

# What is discard?

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

# Which extrusion requires less force and define it.

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.

# What is forging?

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.

# How is forging classified?

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

1. Smith die (Open die) forging;
   1. Hand forging (b) Power forging
2. Impression die (Closed die) forging:
   1. Drop forging (b) Press forging

(c) Maching or upset forging (d) Roll forging

# Define smithing.

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

# When is a hammer called double ended?

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.

# Working on the metal Lead at room temperature is considered to be hot working.Why? (NOV/DEC 2013)

Mechanical working of metal above their recrystallisation temperature is known as Hot working process. The Lead has very low recrystallisation temperature which is close to the room temperature. So working on Lead is known as hot working process.

# List the advantage of cold extrusion over hot extrusion. (NOV/DEC 2013)

* + No oxidation takes place.
  + Good mechanical properties due to severe cold working as long as the temperatures created are below the re-crystallization temperature.
  + Good surface finish with the use of proper lubricants.

# Why is drop forging called so? (NOV/DEC 2014)

Drop forging is a metal shaping process, the metal to be formed is first heated then shaped by forcing it into the contours of a die, this force can be in excess of 2000 tons. The drop forging process can be performed with the material at various temperatures drop forging requires the operator to position the work piece while it is impacted by the ram hence it is called so.

# What does angle of bite in rolling mean? (NOV/DEC2014, 2015, 2018)

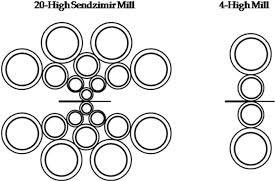
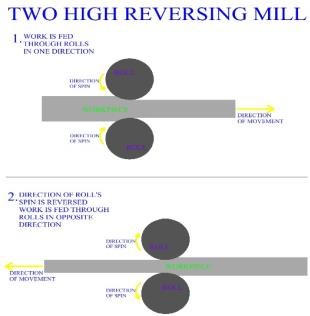
An obtainable angle which is its maximum and is between the first contact of metal and the radius of the roll, it joins the opposing rolls and the centres of them, when metal is rolled.

In practice, the angle of bite is in the order of 20° to 26° in hot rolling with smooth rolls

1. **Define upsetting and drawing down in forging operation (NOV/DEC 2014)** Upsetting: This is applied to increase the cross sectional area of the stock at the expense of the length. To achieve the length of upsetting force is applied in a direction parallel to the length axis, for example: forming of a bolt head.

Drawing down: This is the operation in which metal gets elongated with a reduction in the cross sectional area. For this, a force is to be applied in a direction perpendicular to the length axis.

# Sketch different types of rolling mills



1. **Why is the surface finish of a rolled product better in cold rolling than in hot rolling? (APRIL/MAY 2016)**

In hot working process due to the higher temperature the oxidation and scaling process will occur on the outer surface of the product. Due to that the surface finish will be a poor one in hot rolling.

# What is strain rate sensitivity? (APRIL/MAY 2016)

Strain rate is the change in strain(deformation) of a material with respect to time. It is the most important mechanical characteristic of a superplastic material. Where **σ=k€m**

is the flow stress, k is a constant € is the strain rate, and ‘m’ is the strain rate sensitivity of the flow stress.

# Why is it necessary to condition the metal before hot rolling? (NOV/DEC 2016)

To improve mechanical and physical property of metals.

To maintain temperature of the metals above recrystallization temperature. To remove the scaling, impurities etc present in the surface of the metal.

# Give a few examples of hot forged products. (NOV/DEC 2016)

Riveting of shells for boilers, furnaces etc. Bolts, headed pins, Nuts, keys and hooks. Cams, connecting rods, crank shafts.

Helical and laminated springs.

# How can you reduce the “roll force” in a rolling process? (APRIL/MAY 2017)

In order to reduce the roll force, roll diameter is reduced, or reducing the friction. Another method of reducing rolling force is to apply a small tensile force on the strip.

# Differentiate between hot and cold forging? (APRIL/MAY 2017)

The cold forging manufacturing process is performed at room temperature. The workpiece is squeezed between two dies until it has assumed their shape. To deliver a finished, ready to fit component, the technique includes rolling, drawing, pressing, spinning, extruding and heading.

The hot forging manufacturing process keeps materials from strain hardening at high temperature, which results in optimum yield strength, low hardness and high ductility.

1. **Differentiate flat rolling and shaping rolling? (NOV/DEC 2017,(April/May 2019)** Flat rolling is the most basic form of rolling with the starting and ending material having a rectangular cross-section. The material is fed in between two rollers, called working rolls, that rotate in opposite directions. The gap between the two rolls is less than the thickness of the starting material, which causes it to [deform](https://en.wikipedia.org/wiki/Deformation_(engineering)). The decrease in material thickness causes the material to elongate.

Shaping rolling is the [rolling](https://en.wikipedia.org/wiki/Rolling_(metalworking)) and [roll forming](https://en.wikipedia.org/wiki/Roll_forming) of [structural shapes](https://en.wikipedia.org/wiki/Structural_shapes) by passing them through a rolling mill to [bend](https://en.wikipedia.org/wiki/Bending_(metalworking)) or [deform](https://en.wikipedia.org/wiki/Plastic_deformation) the workpiece to a desired shape while maintaining a constant cross-section. Structural shapes that can be made with this [metal forming](https://en.wikipedia.org/wiki/Metal_forming) process include: I-beams, H-beams, T-beams, U-beams, [angle iron](https://en.wikipedia.org/wiki/Angle_iron), channels, bar stock, and [railroad](https://en.wikipedia.org/wiki/Railroad) [rails](https://en.wikipedia.org/wiki/Rail_tracks).

# What is precision forging? (NOV/DEC 2017)

Precision forging normally means close-tolerance forging. Precision forging and closed die forging have the basic same working principle. The difference is that precision forging has higher requirements on the surface, dimensional tolerances and shape. The precision forgings usually need less machining or without machining. As a process of a one-time forming, precision forging need precision size, weight and shape on forging blanks.

# Name the defects in rolled part? (APRIL/MAY 2018)

* Surface defects
* Internal structural defects
* other defects

# What is meant by recrystallization temperature? (NOV/DEC 2018, April/May 2019)

It is the temperature at which the growth of new stress-free grains are taking place which replaces the old stressed grains formed from strain hardening or work hardening. It is usually 0.5times the melting point of the material.

1. **What are the factors, which influences the working temperature of hot working? (NOV/ DEC 2020)**

The temperature for hot working of metal depends on the temperature of recrystallization, for example, carbon steel requires a temperature more than 10000 C. The upper limit for hot working is determined by various factors, such as excessive oxidation, grain growth, or an undesirable phase transformation. The lower limit of the hot working temperature is determined by its recrystallization temperature. the lower limit of the hot working temperature of a material is 60% its [melting temperature](https://en.wikipedia.org/wiki/Melting_point).

1. **What is meant by tandem drawing ? (NOV/ DEC 2020)**

Cold working improves the mechanical properties. Intermediate annealing is required to restore ductility if subsequent drawing is required. Wire from drawing machines, while arranged in tandem, is coiled in a drum (run by motors) up to a sufficient length before it reenters into the subsequent die. Sometimes it involves dipping the wire inside a lubricant bath before the next stage.

# PART – B (C304.3)

1.What is rolling? Explain the principle of each rolling mills with neat diagram. (NOV/DEC 2020), (NOV/DEC 2019) (13)

2.(i) How metallic wires are made? Explain the process with neat diagram. (Nov/Dec 2019), (NOV/DEC 2015) (08)

1. What are the different forging operations? Explain with neat diagrams. (Nov/Dec 2019)

(7)

1. Explain blanking and punching operation with three processing phases. (April/May 2019)

(13)

1. Explain various forging defects, their causes and remedial actions. (NOV/DEC 2020) (13)
2. Describe the indirect extrusion process for solid and hollow work piece and hydrostatic extrusion process. (08)

(ii) Compare press forging and hammer forging. (08)

1. (i) Distinguish hot and cold extrusion process and briefly explain one in each. (08)

(ii) With suitable examples, explain open-die and closed-die forging. (08)

1. What is shape rolling ? Mention the products of shape rolling and explain production of any one of the products with sketches. (13)
2. Classify the types of forging machines and describe the pneumatic hammer. (10) 10.Explain the tube piercing process. (06)
3. Write a critical note on principle, types, and characteristics and limitations of the extrusion process. (08)
4. (i) Write short notes on extrusion defects. (08)

(ii) How do you compare forged components with cast components? (08)

1. (i) Distinguish between wire drawing and tube drawing with sketches. (08)

(ii) Explain with neat sketches of upsetting and drawing down operations. (08)

1. (i) Discuss the general design considerations for forgings. (08)

(ii) How collapsible tubes of aluminium manufactured? Explain with a neat sketch.

1. Describe the principle of Hot and Cold working processes with advantages & limitations (NOV/DEC 2015) (APRIL/MAY 2015) (13)
2. Distinguish between forging hammers and forging presses. Explain the working of drop hammer with a neat sketch.
3. With suitable sketches, explain the following: (NOV/DEC 2012) (13) (i). Stages involved in ‘Shape rolling’ of structural sections

(ii). Clod extrusion forging (iii). Seamless tube drawing.

1. With sketches describe indirect and direct extrusion (APRIL/MAY 2015) (08)
2. Draw a rolling process and explain deformation of grains in rolling (08)
3. Explain hot working and cold working with their advantages and limitations. (NOV/DEC 2015) (APRIL/MAY 2019) (08)
4. Explain in detail about wire drawing . (08)
5. Explain the principle of extrusion process. Compare the hot extrusion and cold extrusion. (APRIL/MAY 2018) (13)
6. Explain the mechanism of rolling process with clear sketch. Write about some defects associated with rolling. (13)
7. Descibe the ring rolling and thread rolling process (APRIL/MAY 2015) (08)
8. With neat diagram explain the process of forward extrusion. Explain also how hollow sections can be produced in this process. (APRIL/MAY 2016) (13)
9. A 300 mm wide strip 25mm thick is fed through a rolling mill with two powered rolls each of radius = 250mm. The work thickness is reduced to 22mm in one pass, roll speed of 50 rev/min. The work material has a flow curve defined by K= 275 MPa and n=0.15 and the coefficient of friction between the rolls and the work is assumed. If so, calculate the roll force, torque and horsepower. (APRIL/MAY 2016) (13)
10. Write short notes on the following
    1. Shearing (4)
    2. Blanking (4)
    3. Clearance in shearing (4)
    4. Springback in bending (4) (APRIL/MAY 2016)
11. (i) Briefly explain the various operations performed in forging process. (07)

(ii) With suitable sketches, explain the stages involved in shape rolling of structural sections.(NOV/DEC 2016) (07)

1. (i) Explain the working of Mannesmann process with neat sketch. (07)

(ii) How is tube drawing carried out? Explain with suitable sketch. (NOV/DEC 2016)

(06)

1. Derive the mathematical expression for the Flat strip metal rolling process to calculate the rolling load. (NOV/DEC 2016) (15)
2. Sketch and explain the various types of Rolling mill arrangements used in a Rolling process. (APRIL/MAY 2017) (NOV/DEC 2017,2018) (13)
3. Sketch and explain the differences between impression die forging and precission forging operation. (APRIL/MAY 2017) (13)
4. i. Explain the process of making seamless tube. (06)

ii. Discuss how the tubes for shaving creams/ tooth paste is produced. (07) (NOV/DEC 2017) (NOV/ DEC 2019)

1. Explain the preparation requirement for wire drawing process.(NOV/DEC 2018) (13)
2. What are the types of power hammers available and Explain pneumatic hammer. (APRIL/MAY 2018) (13)

# PART- C (C304.3)

1. Sketch and explain the sequence of steps in manufacturing a conneting rod using the forginr process.
2. Explain any one tube manufacturing process with clear sketch.
3. How the threads are produced in fasteners? Identify the method and explain with neat sketch.
4. In which manufacturing process the I-beams,L-Beams are manufactured. Explain it with clear figures.
5. Why solid state welding is preferred to fusion welding during joining of dissimilar of joining of metals. Explain any one solid state welding process with advantages and disadvantages. (APRIL/MAY 2018)

# UNIT – IV SHEET METAL PROCESSES PART – A (C304.4)

1. **Differentiate between blanking and piercing. (Nov/Dec 2019)**

Blanking and piercing are shearing processes in which a punch and die are used to modify webs. The tooling and processes are the same between the two, only the terminology is different: in blanking the punched out piece is used and called a blank; in piercing the punched out piece is scrap.

# What is formability? (NOV/DEC 2019, 2020)

Formability is the ability of a given metal workpiece to undergo plastic deformation without being damaged.

# What is the effect of clearance in the punch and die for shearing sheet metal. (April /May 2019)

If the clearance is too small, then the fracture lines tend to pass each other, causing a double burnishing and larger cutting forces. If the clearance is too large, the metal becomes pinched between the cutting edges and and excessive burr results.

# What is meant by springback?(APRIL/MAY 2017, NOV/DEC 2017, April/May 2019) (NOV/DEC 2020)

During the bending operations, when the pressure on the metal released, there is an elastic recovery by the material and the total deformation will get reduced a little. This phenomenon is called as springback.

# List the sheet metal operations (APRIL/MAY 2015)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Blanking | Punching | Notching | Perforating | Trimming | Shaving | Slitting |
| Lancing | Nibbling | Bending | Drawing | Squeezing |  |  |

1. **Define Blanking.**

Blanking is the operation of cutting a flat shape from sheet metal. The article punched out is called the “Blank” and is the required product of the operation.

# Define Piercing or Punching. (APRIL/MAY 2018)

It is a cutting operation by which various shaped holes are made in sheet metal. In punching the hole is the desired product.

# Define Notching & Perforating

Notching is a cutting operation by which metal pieces are cut from the edge of sheet, strip or blank.

Perforating is a process by which multiple holes which are very small and close together are cut in flat work material.

# Define Bending

In this operation material in the form of flat sheet or strip is uniformly strained around a liner axis which lies in the neutral plane perpendicular to the lengthwise direction of sheet or metal.

# What is a progressive Die?

A progressive die has a series of stations. At each station, an operation is performed on a work piece during a stroke of the press. Between strokes, the piece in the metal strip is transferred to the next station. A finished work piece is made at each stroke of the press.

# Define squeezing.

It is the operation in which the metal is caused to flow to all portions of the die cavity under the action of compressive force.

# Define hobbing:

It is the process of forming a very smooth, accurate polished shape on punch.

# Define Drawing.

Drawing is the process of forming a flat work piece into hollow shape by means of a punch which causes the blank to flow into a die cavity

1. **Enumerate the various typical applications of electro magnetic forming process.** Compression and expansion of circular bar was carried out. It is used for instrument gear assembly, embossing and sizing of cups etc.

# Name any 4 four high power explosive used in explosive forming.

Dynamite, Amatol, TNT (Tri-hitrolnene), RDX (Cyclotrimelthylene trinitramine)

# List out major functions which affect the performance in electromagnetic forming.

High intensity between the coils, Eddy current, Coil compression and Flux concentration

# List out advantages of explosive forming.

Forming process occurs in Small interval of time

Very high compact densities can be obtained Mixtures of metal can be easily compacted

# What is high energy rate forming process?

It includes a number of process in which part are formed at a rapid rate by extremely high pressure. The energy needed for processing the material is released in a very short time. It is called high-energy rate forming process.

1. **What are materials used for making dies in explosive forming?**The commonly used die materials are concrete, world, epoxy, plastics, plaster of paris and CI, stud etc.

# Give the applications of electro hydraulic forming.

Bulging, bending, drawing, blanking and piercing

# Mention the few applications of HERF

* It is used for compacting metal powder
* It is used for forging and cold welding
* It is also used for bending and extruding
* Metal cutting process is also possible

# Classify the high energy rate forming process.

* + Explosive forming,
  + Electro hydraulic forming,
  + Electromagnetic forming,
  + Dynapak high speed forming process.

# What is the principle of magnetic pulse forming?

The basic principle is that discharging of a capacitor through coil over a period of micro seconds, the magnetic flux densities of the order of hundreds of kilogauss can be produced.

# What are the type’s characteristics of sheet metals?

1. Plasticity
2. Malleability
3. Stretch ability

# Define Deep Drawing.

It is the operation in which a flat work piece is formed into a hollow shape and the depth of the formed cup exceeds the diameter of the cup.

# What is stretch forming?

It is the process in which sheet metal is stretched to the yield point in tension and the wrapped over and around the form block.

# Define metal Spinning.

It is the process involving the forming of a work piece over a rotating form block or chuck held in a special lathe.

# Define Embossing.

This is the process making raised or projected design on the surface of the sheets with its corresponding relief on the other side.

# What is lancing operation that is done on sheet metals? (NOV/DEC 2013)

Lancing is a piercing operation in which the workpiece is sheared and bent with one strike of the die. A key part of this process is that there is not reduction of material, only a modification in its geometry. This operation is used to make tabs, vents, and [louvers](http://en.wikipedia.org/wiki/Louver)

# What are the limitations of explosive forming? (NOV/DEC 2013)

1. It is necessary each time either to lower a die weighing many tons into the water or to evacuate the water from the basin and then refill it; ground tremors and the spillage of water owing to the force of the explosion make explosion forming in buildings difficult and usually make it necessary to carry it out at open-air sites
2. Requies Skilled labours

# What are the qualities in metal for maximum streatchability? (NOV/DEC 2016)

Fine grain structure and arrangement of atoms in the lattice.

# What is shear angle angle? Why is it given in punches and dies? (APRIL/MAY 2018)

The angle about which the vertical lines tilt is called shear angle. Shear angle initiates the shearing to complete piercing or blanking on the workpiece. So, it is provided on punches and dies.

# What is flanging? (NOV/DEC 2014) (APRIL/MAY 2015)

Flanging is a process of bending the edges of sheet metals, usually to 90°. In shrink flanging, the flange is subjected to compressive hoop stresses that, if excessive, can cause the flange periphery to wrinkle.

# Name any two super plastic materials. (APRIL/MAY 2016)

The large-grained Fe3Al and Fe Al alloys exhibit all deformation characteristics of conventional fine grain size super plastic alloys.

1. **What are the applications of rubber pad forming process? (NOV/DEC 2016)** Flanged cylindrical and rectangular cups. Spherical domes, shells with parallel or tapered walls. For producing variety of unsymmetrical shapes.

# What are the two most common shearing operations?

Shearing-type operations include: [blanking](https://en.wikipedia.org/wiki/Blanking_(metalworking)), [piercing](https://en.wikipedia.org/wiki/Piercing_(metalworking)), [roll slitting](https://en.wikipedia.org/wiki/Roll_slitting), and trimming.

# Distinguish redrawing and reverse drawing? (NOV/DEC 2017)

In redrawing, the shape change is significant enough (e.g., drawing ratio greater than 2.0) that it must be carried out in two drawing steps, probably with an annealing operation between the steps. In reverse drawing, two draws are accomplished on the part, one in one direction, the second in the opposite direction.

# What are the applications of superplastic forming?

* + In automotive body panels.
  + In forming of aircraft frames and skins.
  + Diaphragm forming of plastics.
  + Complex shape parts – window frames, seat structures.

1. **Write short notes on hydroforming of sheet metal. (NOV/DEC 2018)** Hydroforming uses rubber diaphragm filled with hydraulic fluid. This allows the pressure that forms the work part to be increased to around 100 MPa. Deeper draws can be achieved with the hydroform process than with conventional deep drawing. This is because the uniform pressure in hydroforming forces the work to contact the punch

throughout its length, thus increasing friction and reducing the tensile stresses that cause tearing at the base of the drawn cup.

# What is meant by stand off distance in explosive forming. (NOV/DEC 2018)

Stand off distance is the distance between work piece and explosive and Optimum SOD must be maintained. Optimum SOD is essential for proper forming operation.

# PART- B (C304.4)

1. Explain metal spinning process with neat diagram.(Nov/Dec 2019) (6)
2. List out various stretch forming methods. Explain any one. (NOV/DEC 2020) (13)
3. Explain magnetic pulse forming with neat sketch. (Nov/Dec 2019) (06),

NOV/DEC 2018) (05)

1. Enumerate about stand off distance in explosive forming.(April/May 2019) (13)
2. Explain about the types of tube bending . (April/May 2019) (13)
3. Describe shearing operations in a sheet metal work with a neat sketch. (13)
4. Describe various types of bending operations with its neat sketches. (NOV/DEC 2012) (APRIL/MAY 2015) (13) (Nov/Dec 2019) (07)
5. Explain peen forming process with a neat sketch (06)
6. Explain the Explosive forming process with suitable sketch.(NOV/DEC 2015, 2016) (APRIL/MAY 2017) (13)
7. Explain the following process with neat sketch. (13)
   * Electro hydraulic forming(NOV/DEC 2015) (NOV/DEC 2012)
   * Electromagnetic forming
8. With a suitable sketch explain the working principle of a sheet metal cutting die.(13)
9. With neat diagrams explain the process of Hydroforming. (NOV/DEC 2018) (13)
10. Enumerate with a neat sketch any two type of stretch forming operations. (NOV/DEC 2015) (APRIL/MAY 2017, 2018) (13)
11. Classify the extrusion process. Explain the backward extrusion and cold extrusion forging operations. Compare hot and cold extrusion. (13)
12. Explain the mechanism of rolling process with clear sketch. Write about some defects associated with rolling. (13)
13. Explain the various properties of sheet metal. (08)
14. Describe the nibbling and nothching operations. (08)
15. Explain coining and embossing process indetail. (08)
16. Explain the advantages and disadvantages of compound die over progressive die. (NOV/DEC 2015) (08)
17. Explain the various sheet metal forming operations with neat sketches. (08)
18. With neat sketches explain the following (i) Hydro forming and (ii) Super plastic forming. (NOV/DEC 2016) (6+7)
19. (i) What is stretch forming? Explain how it is useful for forming large metal parts?

(ii) Discuss any one method of testing formability of sheet metal. (NOV/DEC 2017) (13)

25. With neat sketch explain rubber pad forming and how does it differ from rubber hydro forming? (APRIL/MAY 2018, NOV/ DEC 2020) (13)

# PART- C (C304.4)

1. Identify the metal forming process in which Rocket nose can be manufactured.
2. How the air craft wings are manufactured? Identify the process and explain it with sketch.
3. What is high energy rate forming? List the different types and explain any 2 in detail with sketch.
4. Explain with necessary sketches application of following sheet metal forming operations: Shaving, Slitting, Notching. (NOV/DEC 2018)
5. Suggest a suitable procedure for making a bolt and elaborate the procedure. (APRIL/MAY 2018)
6. Discuss different test requirements of formability of sheet metal. (NOV/DEC 2020)

# UNIT V-MANUFACTURING OF PLASTIC COMPONENTS PART - A (C304.5)

* 1. **What are the advantages and limitation of compression moulding.(Nov/Dec 2019)**

(1) The loss of raw materials is small and will not cause too much loss (usually 2%~5% of the product quality). (2)The internal stress of the product is very low, the warping deformation is also very small, and the mechanical properties are relatively stable. **Disadvantages of Compression Molding**

For heavy handle, compression molding would be slower than transfer or injection because in transfer the plastic is thoroughly heated and is precompressed almost to its final density prior to entering the mold.

* 1. **What are the different types of plastics used for blow moulding. (Nov/Dec 2019)** Blow Molding Materials. Materials include different grades of polyethylene, polypropylene, nylon, and PET, PET being the most common.

# Make a short note on film blowing. (April/May 2019)

Blown film extrusion is a technology that is the most common method to make plastic films, especially for the packaging industry. The process involves extruding a tube of molten polymer through a die and inflating to several times its initial diameter to form a thin film bubble.

# How is homo polymer is differ from copolymer. (April/May 2019)

The main difference between homopolymer and copolymer is that homopolymers are produced by using a single type of monomer, whereas copolymers are formed by using two different types of monomers.

# Define monomer.

It is a small molecule that consists of a single unit or blocking block.

# Define the term polymers.

Any of numerous natural and synthetic compounds of usually high molecular weight consisting of up to millions of repeated linked units, each a relatively light and simple molecule.

# Define Homopolymer.

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

# Why are additives used?

Additives used to improve the properties and performance of polymers.

# Why are fillers used?

* + 1. It improves the compressive and tensile strengths of the polymer.
    2. Reduces the cost of the final product.

# What are the characteristic of thermoplastics?

Thermoplastics polymers soften when heated and harden, when cooled. These types of polymers are soft and ductile. They have low melting temperature and can be repeatedly moulded and remoulded to the required shapes.

# Define the term synthetic resins.

A resin having a polymeric structure; especially a resin in the raw state; used chiefly in plastics.

# List out few characteristics of polymer.

* High Corrosion resistance.
* Low thermal and electrical properties.
* Low density.
* Light weight

# What is film blowing? (APRIL/MAY 2018) (NOV/DEC 2018)

In this process a heated doughy paste of plastic compound is passed through a series of hot rollers, where it is squeezed into the form of thin sheet of uniform thickness.

It is used for making plastic sheets and films. Air is blown into the centre of the extruded tube and causes it to expand in the radial direction.

# Write down the classification of plastics.

1. Thermoplastic polymers 2. Thermosetting polymers

# What are the characteristics of thermoplastics?

Thermoplastics (also referred to as thermo-engineering plastics) are high molecular weight polymers that become liquid upon heating and glassy solids on cooling. Bonding between molecules of a polymer could be of varying strength, thus resulting in different types of thermoplastics, i.e., polythenes that have relatively weak attractive forces (van der Waals forces), stronger hydrogen bonds in nylon, and very strong stacked aromatic ring bonds in polystyrene.

# Differentiate thermosetting and thermo plastics? (NOV/DEC 2013)

1. Thermoplastics can be re-melted and recycled fairly easily
2. Thermosets typically are cured and molded into shape and are not recycled as easily

# What is the difference between rotational moulding of plastics and other plastic methods?(NOV/DEC 2020)

Rotational moulding (often referred to as Rotamoulding or Rotomoulding) is a process used for producing hollow plastic products. By using additional post-moulding operations, complex components can be produced enabling the process to compete effectively with other moulding and extrusion practices.While all other methods, produces less cycle time and less complex parts.

1. **Give the list of products produced using blow moulding? (APRIL/MAY 2017)** Small products may include bottles for water, liquid soap, shampoo, motor oil, and milk, while larger containers include plastic drums, tubs, and storage tanks.

# What is parison?

A cylindrical tube of resin that is placed within a mold. Positive air pressure forces the parison to fill the mold.

# Define the term thermoforming. (APRIL/MAY 2017)

Thermoforming is a manufacturing process where a plastic sheet is heated to a pliable forming temperature, formed to a specific shape in a mold, and trimmed to create a usable product. The sheet, or "film" when referring to thinner gauges and certain material types, is heated in an oven to a high-enough temperature that it can be stretched into or onto a mold and cooled to a finished shape

# What is prepreg ?

The term "prepreg" is actually an abbreviation for the phrase pre-impregnated. A prepreg is an FRP reinforcement that is pre-impregnated with a resin. Most often, the resin is an epoxy resin, however other types of resins can be used, including the majority of thermoset and thermoplastic resins.

# List the advantage of cold forming of plastics.

* + Speed, Net / Near net shape to eliminate or reduce secondary operations
  + Consistency / dimensional accuracy
  + Quality / surface finish
  + Material savings & elimination of scrap
  + Improvement in mechanical properties, greater strength to weight ratio, unbroken grain flow.

# What is lamination process?

The process of applying a film of plastic on the surface of any item is known as laminating. When plastic coating is added to any item it becomes tear-proof and waterproof, since the laminating film encapsulates the item completely by being bonded to both its sides.

# List any four types of adhesives used in adhesive bonding of plastics. (NOV/DEC 2014)

Adhesive bonding has unique applications that require strength, sealing, thermal and electrical insulating, vibration damping, and resistance to corrosion between dissimilar metals. Mechanical fastening involves traditional methods of using various fasteners, especially blots, nuts, adhesive bonding, fusion fastening and rivets. The joining of plastics can be accomplished by various external or internal heat sources, and mechanical.

# What is polythene?

Polythene is a polymer of ethylene; especially : any of various partially crystalline lightweight thermoplastics (CH2CH2)x that are resistant to chemicals and moisture, have good insulating properties,and are used especially in packaging and insulation.

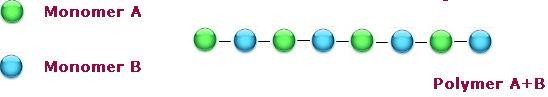
# Name the common thermosetting plastics.

Epoxy resins - used as coating materials, caulks, manufacture of insulating materials, etc Phenolic resins - tool handles, billiard balls, sprockets, insulation, etc

Unsaturated polyester resins - manufacture of plastics reinforced fiberglass commonly known as polyester.

# Define Polyaddition? (APRIL/MAY 2015, NOV/ DEC 2020)

Polyaddition are reactions in which the polymer is originated by successive additions of functional groups (monomer A) inside of molecular structures with double bonds (monomer B).



# Viscosity is an important property of a polymer melt in plastics shaping process. Upon what parameters does viscosity depend? (APRIL/MAY 2016)

A fluid's viscosity strongly depends on its Temperature. Along with the Shear rate,and molecular weigh of the polymer affects the viscosity.

The temperature really is dominating influence. The higher the temperature is, the lower a substance's viscosity is. Consequently, decreasing temperature causes an increase in viscosity.

# Name the various methods of processing thermoplastics. (NOV/DEC 2016)

Injection moulding, Rotational moulding, Blow moulding, Flim blowing Vacuum forming and sheet forming process.

# What are commonly used fillers? (NOV /DEC 2017)

Inert fillers that are most commonly used include calcium carbonate (chalk), talc and barium sulphate. It add rigidity but reduces impact strength in moulding rubic cube that uses talc powder as 20% filler to improve lubrication .

# What is the difference between a positive mould and a negative mould in thermoforming? (APRIL/MAY 2016)

|  |  |
| --- | --- |
| **Positive mould** | **Negative mould** |
| A positive mould has a convex shape | Negative moulds have concave cavities. |
| The heated sheet is draped over the convex form using pressure | The heated sheet is draped over the concave form using vacuum |

1. **Define potting and encaptulation. (NOV/DEC 2017)**

Potting is the process of partially or completely filling or embedding an enclosure with a compound for the purpose of providing resistance to shock and vibration, as well as creating a seal against moisture, solvents, and corrosive agents..

Encapsulation is a process of impregnation of electronic assembly inside the compound with the help of a reusable mold. Typically the reusable mold is made out of hard to adhere to materials such as Teflon or Silicone. The purpose of encapsulation is to create a protective “shell” around the assembly.

# Name some of the thermosetting plastics used in industries. (APRIL/MAY 2018)

* Epoxy resin
* Polyster resin
* Urea Formaldehyde
* Melamine Formaldehyde

# Write a note on thermoset plastics. (NOV/DEC 2018)

A thermosetting polymer, resin, or plastic, often called a thermoset, is a [polymer](https://en.wikipedia.org/wiki/Polymer) that is irreversibly hardened by [curing](https://en.wikipedia.org/wiki/Curing_(chemistry)) from a soft solid or viscous liquid [prepolymer](https://en.wikipedia.org/wiki/Prepolymer) or resin. Curing is induced by heat or suitable [radiation](https://en.wikipedia.org/wiki/Radiation) and may be promoted by high pressure, or mixing with a [catalyst](https://en.wikipedia.org/wiki/Catalyst). It results in chemical reactions that create extensive [cross-](https://en.wikipedia.org/wiki/Cross-link) [linking](https://en.wikipedia.org/wiki/Cross-link) between polymer chains to produce an [infusible](https://en.wiktionary.org/wiki/infusible) and [insoluble](https://en.wikipedia.org/wiki/Insoluble) polymer network.

# PART – B (C304.5)

1. Explain about transfer moulding with its advantage and disadvantages. **(April/May 2019, Nov/Dec 2019)**
2. Enumerate with neat sketch about Solvent bonding. (NOV/DEC 2013)**(April/May 2019)**
3. Explain the characteristics of plastics. (Nov/Dec2019) (8)
4. Explain the principle of operation of blow moulding with neat diagram (Nov/Dec2019) (6)
5. Explain the principle operations of plastic injection moulding process with plunger and screw setup with diagram. (Nov/Dec2019) (7)
6. With a neat sketch explain the process of plastic injection moulding. (April/May 2018)

(13)

1. Discuss the working principle of injection moulding with a neat sketch. (APRIL/MAY 2015) (10)
2. Explain the Reciprocating Screw Injection Moulding of plastics with advantages and limitations (NOV/ DEC 2020) (13)
3. Explain the various types of process involved in compression moulding with neat sketch. (APRIL/MAY 2016) (13)
4. Explain the transfer moulding process.(NOV/DEC 2012) (13) 11.List the parameters considered while design of injection molded parts. Explain the significance of any 4 parameters. (13)
5. What are the methods of bonding thermoplastics? Explain any one method. (13)
6. Write down the characteristics of shaping processes for plastics. (08) 14.Briefly explain film blowing & bonding of themoplastics. (APRIL/MAY 2018) (13)
7. Descibe briefly the plunger type injection moulding process for producing plastic components.(NOV/DEC 2012) (08)
8. Explain various types of thermoforming method shaping thermoplastics. (NOV/DEC 2015)
9. The nominal length (L) of a part made of polyethylene is to be 80mm. Determine the corresponding dimension of mould cavity (Lc) that will compensate for shrinkage (consider the shrinkage of polyethylene S=0.025) (05)
10. Explain the structure of thermoplastic and thermosetting plastics. Compare the thermo and thermosetting plastics. (APRIL/MAY 2015) (13)
11. a) Explain the calendering process.(APRIL/MAY 2015) (08)

b) Describe any two types of thermoforming process.(APRIL/MAY 2015) (08)

1. Discuss any two of the defects that can occur in plastic injection moulding. (APRIL/MAY 2016) (06)

21 . Describe the following plastic processing methods with neat sketches (i) compression moulding (ii) Blow moulding. (NOV/DEC 2015) (6+7)

1. (i) Why is the thermoforming a valuable method for the plastic manufacturer? Explain the process with neat sketch. (ii) State the purpose of the following in plastics
   1. Plasticizers (2)Fillers (3)Stablizer. (NOV/DEC 2015) (7+ 6)
2. Explain the Rotational moulding process used in manufacturing plastics, with a neat sketch.(APRIL/MAY 2017) (13)
3. Explain the Compression moulding process with a neat sketch. (APRIL/MAY 2017) (NOV/DEC 2018) (13)
4. Describe the process of extrusion of plastics? (NOV/DEC 2020) (13)

# PART- C (C304.5)

1. Suggest and explain suitable process for forming hearing - aid. Also, highlight its capabilities. (NOV/DEC 2017) (15)
2. Illustrate with suitable sketch, and explain the process for producing plastics beverage bottles.
3. Name and explain the suitable process for producing the barrel and plunger of syringe.(NOV/DEC 2017) (15)