(1) Define Elasticity?

Ans- It is the ability of Material to deform on applying to load and return to original Shape on removal of load.

(2) Define Plasticity?

Ans- Ability to deform on applying load but don't return to original Shape on removal of load (permanent deformation)

(3) Define Hardness?

Ans- Resistance of material for Identation. Ability of material to resist the Identation.

(4) Define Toughness?

Ans- capacity of a material to absorb energy before fracture is known toughness.

(5) Define Malleability?

Ans- Ability of Material to deform in the thin plane sheet without any crack under cold working condition.

(6) Define Ductility?

Ans- Ability of a material to deform logitudinally under tensile force is known as Ductility.

(7) Define Machinability?

Ans- Machinability is the ease with which a metal can be cut permitting the removal of the material with a satisfactory finish at low cost. Materials with good machinability require little power to cut, can be cut quickly, easily obtain a good finish.

(8) Define castability?

Ans- castability is the ease of forming a quality casting. A very castable part design is easily developed incurs minimal tooling costs, requires minimal energy and has few rejections. castability can refers to a part design or a material property.

Q-9 Define Formability?

Ans- Formability is the ability of a given metal workpiece to undergo plastic deformation without being damaged. The plastic deformation capacity of metallic materials. However, is limited to a certain extent, at which point, the material could experience tearing or fracture (breakage).

Q-10 Define Weldability?

Ans- The weldability, also known as joinability, of a material refers to its ability to be welded. Many metals and thermoplastics can be welded, but some are easier to weld than others. A material's weldability is used to determine the welding process and to compare the final weld quality to other material.

Q Short note on Superalloys?

=> A superalloy, or high-performance alloy, is an alloy that exhibits several key characteristics: excellent mechanical strength, resistance to thermal creep deformation, good surface stability, and resistance to corrosion or oxidation. The crystal structure is typically face-centred cubic. Examples of such alloys are Hastelloy, Inconel, Waspaloy, Rene alloy set.

Superalloy development has relied heavily on both chemical and process innovations. Superalloys develop high temperature strength through solid solution strengthening. An important strengthening mechanism is precipitation strengthening which forms secondary phase precipitates such as gamma prime and carbides, oxidation or corrosion resistance is provided by elements such as aluminium and chromium.

The primary application for such alloys is in turbine Engine, both aerospace and marine.

es Composition, Mechanical Properties and Application of Gray Cast Iron?

Ans → Composition: Cast iron is a group of iron-carbon alloys with a carbon content greater than 2%. Its usefulness derives from its relatively low melting temperature.

Carbon(C) ranging from 1.8 to 4 wt% and Silicon (Si) 1-3 wt% are the main alloying elements of cast iron. Iron alloys with lower carbon content are known as Steel. Cast iron is made from pig-iron, which is the product of smelting iron ore in a blast furnace.

Mechanical Properties of Cast Iron:

1) Hardness - Material's resistance to abrasion and indentation.
2) Toughness - Materials ability to absorb energy.
3) Ductility - Material's ability to deform without fracture
4) Elasticity - Material's ability to return to its original dimensions after it has been deformed.

Applications of Gray Cast Iron:

→ Gray cast iron usable in engineering industry, casting large size machine, with high complexity, the details do not bear the big bend, but need good compression strength.

→ Gray cast iron has a number of applications in the culinary field. It is used to make pots and pans and all sorts of utensils that are used for heating purposes. This is because the cast iron surface distributes the heat from the stone evenly all over its surface. It can be also be used for baking purposes.

→ It is even used to make stoves from a single piece of mould.

→ Besides this, cast iron is widely used in piping applications, engines, part of automobiles and we are earlier used in building bridges.

Ques Write short notes on "thermosets polymer"?

Ans- They can't tolerate repeated heating cycle as like in thermoplastics.

Thermosets when initially heated they softened but at a elevated (particular) temperature also produce a chemical reaction that harden the material into an infusable solid. If repeated then thermoset will degrade.

Example: epoxy, bakelite. etc

They are often called as thermoset, is a polymer that is irreversibly hardened by curing from a soft solid or viscous liquid prepolymer or resin. curing is induced by heat or suitable radiation and may be prompted by high pressure or mixing with a catalyst. It results in chemical reactions that creates extensive cross-linking between polymer chains to produce an infusible and insoluble polymer network.

Ques write short note on thermoplastic polymers?

Ans- Polymer is a compound containing long chain molecules, each molecule made up of repeating units connected together.

There may be thousand or million of unit in a single polymer molecule. They are often called solid material at room-temperature but they become viscous liquids when heated to temperature upto few low Degree.

This characteristic allows them to be easily and economically fused into products.

They can be subjected under heating and cooling cycle repeatedly without significant degradation of polymer.

Examples: PVC, Polystyrene, polyurethane, polypropylene, nylon etc.

Q5 - Composition, Mechanical properties and applications of Nodular Cast?

Ans - Composition:

=) It has carbon content 3.2 to 6.0 %.
=) Silicon 2.2 to 2.8 %.
=) Manganese 0.1 to .2 %.
=) Magnesium 0.03 to 0.04 %
=) Phosphorus 0.005 to 0.04 %.
=) Sulphur 0.005 to 0.02 %.
=) Copper < 0.40 %.
=) Iron balance

Elements such as copper or tin may be added to increase tensile and yield strength while simultaneously reducing ductility.
Ductile iron, also known as ductile cast iron, nodular cast iron, spheroidal graphite iron, spheroidal graphite cast iron and SG iron.

Mechanical Properties:

It has remarkable mechanical properties to the spheroidal shape of its graphite.

- tensile strength.
- Impact resistance.
- high elastic limit.
- good elongation.
- compression strength
- castability
- abrasion resistance
- Machinability
- fatigue strength.

Applications of Nodular Cast iron:

→ Ductile or Nodular cast iron are used in making pressure pipes and fittings. It has excellent strength and toughness.

→ Automotive industry is the second largest ductile iron casting application fields. Almost all crankshafts of the Ford-Motor Company. Have been manufactured by ductile iron

→ Agriculture, road and construction applications. Modern agriculture required a reliable and long service life of agricultural machinery.

Ques- Composition and Mechanical properties and applications of white cast iron.

Ans- Composition:

White cast iron usually contains 1.8% - 3.6% C, 0.5% - 1.9% Si and 1% - 2% Magnese (Mn). Its fracture surface is white, therefore known as white cast iron. It is generally cast as soft and strong.

Mechanical properties

1. It is hard, brittle & interstitial compound.
2. Due to large amount of cementite; it is hard & brittle but extremely brittle & difficult to machine.
3. The range mechanical properties for unalloyed white irons is as follows: hardness, tensile strength, compressive strength, modulus of elasticity.

Applications of white cast iron:

1) It is used in railway brake shoes,
2) It is used in grinding balls.
3) It is used in crushing rollers etc.

Ques Composition, Mechanical properties and applications of malleable cast iron?

Ans- Composition:

It is obtained by heat treatment of white cast iron and carbon is present in the forms of clusters. Malleable cast iron also contains sometimes small amounts of chromium (0.01% to 0.03%), boron (0.0020%), copper (up to 1.0%), nickel (0.5% to 0.8%) and Molybdenum (0.35% to 0.5%).

Mechanical Properties :

→ The structure prompted toughness and ductility because of its combination of nodular graphite and low carbon metallic matrix.

When copper is added to added to it increase in tensile strength, corrosion resistance etc.

Application area :

→ It can be widely used as pipe fittings.
→ chain-hoist assemblies, Railroad equipments.
→ Also as industrial castors etc.
→ It can be widely used in also in small tools, pipe fitting, automobile parts, farms implements etc.

- LOW CARBON STEELS :

Low carbon Steels contains less than 0.2% carbon meet common steel known as mild steel, high strength plates, sheets, rods, machine components, nut and bolts are manufactured by it.

- MEDIUM CARBON STEELS :

Medium carbon Steels contain 0.2 - 0.5% carbon. It is used where high strength is required like engine components.

- HIGH CARBON STEELS :

High carbon Steels contain 0.5 - 2.11% carbon. It is used for tools, blades, spring etc (in high-strength applications.)

- **STAINLESS STEEL**

Alloys Steels assigned to provide high corosion resis along with high Strength and ductility. It contains mo than 12% of ot. other elements are Ni, Mo, Ti, Si, Mn etc. It is mainly used for kitchen, Surgical, chemical and food processing equipments.

- **COPPER ALLOYS (BRASS & BRONZE)**

* **BRASS:**

It contains 65% cu & 35% zn and has high conductivity adequate Strength and ductility.

* **BRONZE:**

It contains 90% cu and 10% Tin and good Strength and toughness and wear Strength and corrosion resistance.

- **ALUMINIUM ALLOYS**

Extensively used to create aircraft, but car and marine craft bodies cooking utensils etc, has high Strength to weight ratio resistance to corrosion good electrical and thermal conductivity.

Ques- Write Short note on composite material?

- Composite Materials:

These are heterogeneous consisting of 2 or more diff. materials that are Metallurgical or mechanically bonded together. The combination of material provides for Superior property.

: Compare to constituents. These materials possess unique combination of prop. such as strength weight, stiffness, corrosion - resistance, hardness, conductivity etc.

There are 3 types of composites:

- LAYER
- PARTICULATE
- FIBER - REINFORCED

Define:

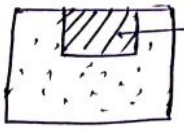
- Pattern: Pattern is a replace of the object to be cast used to prepare me cavity into which molten material will be powed during casting.
- Allowaness: Pattern is always made larger than the required size of casting. considering the various allowances. These are the allowances which are usually provide in a ~~products~~ pattern
- Shrinkage allowances: After solidification of the metal from further cooling dimensions of the patterns increase. So pattern size is bigger than that of the finished cast products.
- Draft allowances: Pattern draft is the taper placed on the pattern surfaces that are parallel to the dirn in which the pattern is withdrawn from the mould to allow removal of the pattern without damging the mould cavity.
- Distortion allowances: The allowance is taken into consideration when casting products of irregular shapes. when these are cooled they are distorted due to metal shrinkage.

- FINISHING ALLOWANCES : Machining allowances or finish allowances indicates how much larger the rough casting should be over the finished casting to allow sufficient material to insure that machining will clean up the surface.
- SHAKING ALLOWANCES: To take the pattern out of the mould cavity it is slightly shopped to detach it from mould cavity. So cavity is increased a little.

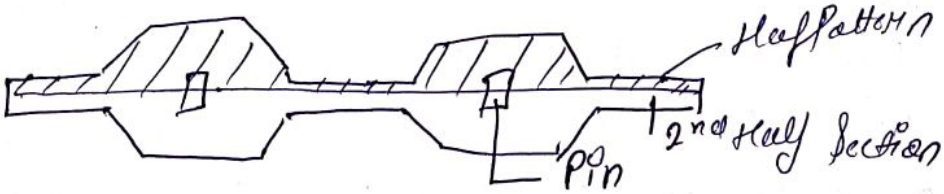
Ques Write a short note on different types of pattern and pattern material used in foundary.

Ans- TYPES OF PATTERN:

- SINGLE PIECE PATTERN : It is used with only one piece which is placed in mould cavity.



- SPLIT PATTERN: It is used for intricate and complex shape design. Here pattern have 2 halves which is placed one in cope and another in drag box and boxed are champed by pin.



- MATCH PLATE PATTERN : Match plate pattern have 2 equal halves of patterns which are placed in mould cavity. ex → piston ring.
- GATED PATTERN: In case of gated pattern gate and are integrated with pattern itself. There is no need to create a extra passage for gating system

. LOSES PIECES PATTERN: It is used to create intsicate design in mould cavity. Here, loses pieces are placed by wire in cavity.

• TYPES OF PATTERN MATERIAL:

1. WOOD: Wood is one kind of material which easily available, cheap but its absorption moister.

2. Metal: Metal have all preferred prop. So that casted product surface finished is better.

3. Wax: Wax pattern also have less density & cheap and give a good surface finished but size of pattern is less than 5kg.

4. Plastics: This patterns are pre-preferred where were patterns are not suitable.

Ques- List any 10 types of defects in casting along with causes and remedies?

(1) SHIFT OR MISMATCH:

The defect caused due to misalignment of upper and lower part of the casting.

(2) CAUSES:

- Improper alignment of upper and lower part during mould preparation.
- Misallignment of flask.

REMEDIES:

- Proper allignment of the pattern or die part,
- check the allignment flask.

② SWELL

It is used the enlargement of the pattern / mould cavity because of the molten metal pressure.

Causes :

- Defective or improper Ramming of the mold.

Remedies:

- The Sand mould should be rammed properly and evenly.

③ BLOWHOLES

When gases entrapped on the surface of the casting due to solidifying metal, a rounded or oval cavity is formed called as blowmass

Causes :

- excessive moisture in the sand.
- Too hard rammed sand.

Remedies :

- Sufficient Ramming should be done.
- Adequate venting facility should be provided.

④ Drop.

It occurs when there is cracking on the upper strength of the sand and sand pieces fall into molten metal.

Causes

- Soft Ramming and low strength of sand.
- Insufficient Reinforcement of sand projections in the cope.

Sand of high strength should be used with proper ramming.
- Sufficient reinforcement of sand projection in the cope.

(5) SHRINKAGE CAVITY:

The formation of cavity in the casting due to volumetric contraction is called as shrinkage cavity.

Causes:
- uneven or uncontrolled solidification of molten metal.
- Pouring temp. is too high.

Remedies:
- This defect can be removed by applying principle of directional solidification in mold design.

(6) COLD SHUT

It is a type of surface defects and a line on the surface can be seen.

Causes
- Poor gating system.
- Lack of fluidity.

Remedies:
- Improved grating system
- Proper pouring temperature.

(7) MISRUN:

When the molten metal solidifies before completing filling the mould cavity and leaves a space in the mould called as misrun

Causes:
- Low fluidity of molten metal.
Low temp. of molten metal and decrease its fluidity.

Remedies:
- Increasing pouring temperature of molten metal increases the fluidity.
- Proper gating system.

(8) SLAG INCLUSION:
This defect is caused when the molten metal containing slag particles is poured in the mold cavity and it gets solidified.

Causes:
- The presence of slag in molten metal.

Remedies:
- Remove slag particles from the molten metal before pouring it into the mold cavity.

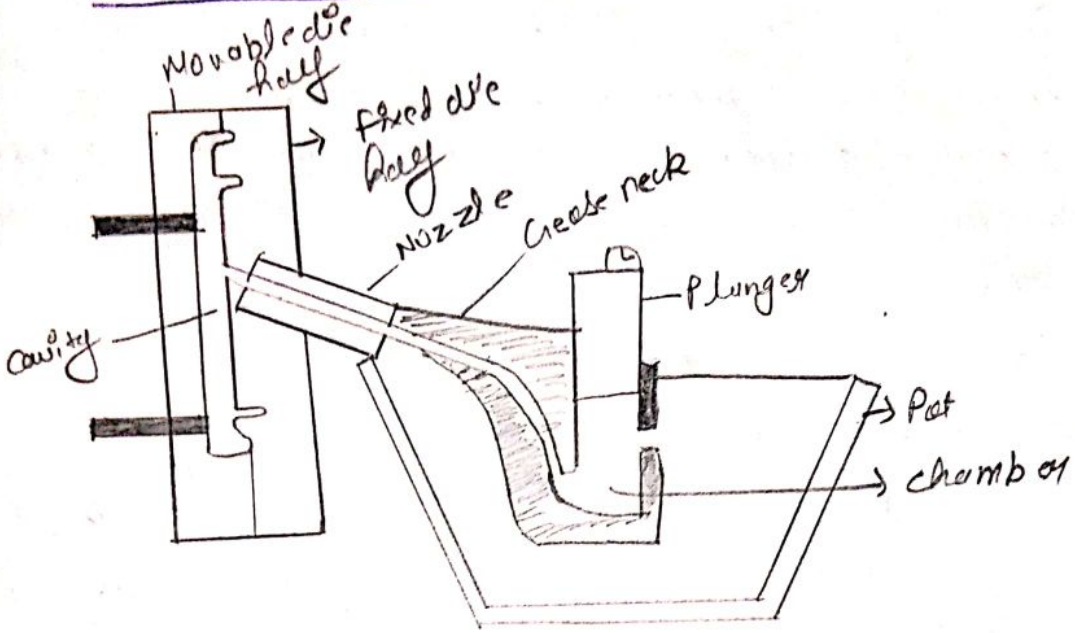
(9) HOT TEARS
The failure of casting in this case is looks like cracks and called as hot tears.

Causes:
- Improper mold design.

Remedies:
- Elimination of residual stress from the material of the casting.

Write a short note on hot and cold chamber die-casting method with diagram.

Ans- HOT CHAMBER



Hot chamber die casting is a type of die casting that uses alloys with low melting temp. In a hot chamber die casting machine, the fixed die half is called a cover die, which is mounted to a stationary plates and allign with nozzle of the goose neck. The metal is contained in an open holding pot, which is placed in the furnance and melted to the needed temperature when the plunger moves down, it forces the molten metal through a gooseneck & into the die at injection pressures ranging from 10,00 - 5000 psi. The machine pushes the moving plate towards the cover die and holds it closed with great pressure until the molten metal is injected. The plunger remains in the "down" position to hold the pressure while the casting "cools off". After solidification, the plunger is retracted and the castpart is either ejected, manually removed from the machine or pushed off the cover die.

COLD CHAMBER CASTING

As a contrast from hot chamber die casting, molten metal is ladled from the furnance into the shot chamber through a pouring hole. While the general function of cold chamber machine is similar to hot chamber, cold chamber works with a horizontal orientation and doesn't have a goosneck. Instead, the plunger forces metal through the shot chamber into the die at the pressure ranging from 2K to 20K psi. The plunger holds the pressure and rest- ~~retracts~~ after solidification.

The clamping unit and mounting of dies is set up the same as hot chamber, however the cover die for a cold chamber machine doesn't have a goosneck or nozzle, and therefore aligns directly from the shot chamber.