

UNIT-I

ALLOYS AND PHASE DIAGRAMS

1. i) Explain briefly Isomorphous phase diagram for Cu-Ni system and Ideal phase diagram (soluble and insoluble) ii) How are solid solutions classified? Give example for each.
2. Explain the types of cast iron? Draw the microstructure of any four types of cast iron?
3. How will you plot binary phase diagram for two metals which are completely soluble in liquid and solid states? .
4. Draw Iron-iron carbide equilibrium diagram and mark on it all salient temperatures and composition fields.
5. Name the phase reactions occurring in Fe-Fe₃C system. What are the temperatures and compositions at which they occur?
6. Explain the primary crystallization of eutectoid steels, hypoeutectoid steels and hypereutectoid steels.
7. Explain in brief the properties and applications of cast Iron types. 8. Draw Fe-C diagram and mark all the phases and explain the reactions?

UNIT-II

HEAT TREATMENT

1. Draw a neat sketch of the TTT diagram for eutectoid steel and label the regions. Mark the different products formed on this diagram
2. What is a CCT diagram? Describe various cooling curves on CCT diagrams. How such curves are drawn? Write short notes on critical cooling rate
3. Explain how Jominy end quench test is used for determining the hardenability of steels
4. Brief about tempering process and explain CCT diagram. 5. Define the types of annealing Process and explain them?
6. What is meant by carburizing of steels? Briefly explain the various types of carburizing
7. Enumerate Martempering and Austempering

UNIT-III

FERROUS AND NON-FERROUS METALS

1. Discuss the influence of various alloying element addition in steels

2. Discuss the composition, properties, application- Maraging steels, Tool steel ,HSLA
3. Discuss the composition, properties and typical application of any four copper alloys.
4. Explain the composition properties and typical application of some aluminium alloy?
5. Write short notes about the following materials in terms of composition properties and application (i) Maraging Steel (ii) Austenitic Stainless Steel (iii) Alpha Beta Brass
6. Explain Ni based super alloys and Ti alloys .
7. What is an alloy steel? How are alloy steels classified? Explain them.
8. Explain the steps involved in precipitation hardening?

UNIT-IV

NON-METALLIC MATERIALS

1. What is polymerization? Describe addition polymerization and condensation polymerization.
2. Explain about the following thermoplastics; [1] polyethylene [2] Polyvinyl chloride [3] Acetyl [4] polyamides
3. List the properties and assess the typical applications of the following thermoplastics [1] PTFE [2] PMMA [3] PET [4] PEEK [5] PE
4. Explain in the following : PET, PC, PA, ABS
5. What are the special properties of plastics that make them suitable for engineering applications? Describe the concept of 'Co-polymerization'
6. Name suitable alloys , polymers and ceramics for manufacturing the following items.
 1. Bush 2. furnace heating element 3. lathe bed 4. coins 5. girders for airship 6. Big end bearing
 7. Turbine blade 8. knobs
7. Describe the properties and applications of following structural ceramics a. Alumina and Partially stabilized zirconia (PSZ) b. Silicon carbide and Silicon nitride c. Sialon
8. With the schematic diagram illustrate the processing of reinforced composites.

UNIT-V

MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

1. Critically compare the deformation by slip and twinning?

2. Explain the mechanism of plastic deformation of metals by slip and twinning?
3. Write an engineering brief about the creep test?
4. What are the different types of fractures in metallic materials? Formulate the important features of these fractured surfaces. What is the use of this study?
5. Draw a typical creep curve and explain the various stages of creep
6. Describe with neat sketch fatigue test.
7. With the help of neat sketches explain the difference between brittle and ductile fracture.
8. Describe Brinell hardness test to determine the hardness of a metal.
9. Explain the procedure for performing the Rockwell test.
10. Explain the testing procedure for Vickers hardness test and mention the advantages and limitations.
11. Describe how the torsion test is conducted and what are the properties from this test?