KINGS COLLEGE OF ENGINEERING, PUNALKULAM-613303.
DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

YEAR/SEMESTER:II / IV

Subject: ME2251-Engineering Materials &Metallurgy

UNIT-I

PART-A

1. What is an alloy?

2. Define solid solution.

3. Define solute and solvent.

4. What are the different types of solid solutions?

5. Explain the Substitutional solid Solution.

6. Explain the Interstial solid Solution.

7. What is phase diagram? and its importance.

8. Differentiate between eutectic and eutectoid.

9. Differentiate between peritectic and peritectoid.

10. What is mean by "allotropy of iron"?

11. Define ferrite and austenite.

12. Define cementite, pearlite.

13. Define martensite, bainite.

14. Differentiate between steel and cast iron.

15. What is meant by hypo eutectoid, hypereutectoid steel?

16. What is meant by hypo eutectic, hyper eutectic C.I?

17. What are cooling curves?

18. Drawn the cooling curve for the pure metal, binary solid solution and binary eutectic system.

UNIT-I ()
PART-B

1. Discuss the similarities and differences between substitutional and interstitial solid solution?

2. What is cooling curve? How does the time temperature cooling curve of an alloy of eutectic composition different from that of a pure metal?

3. Explain:

1. Eutectic reaction

2. Eutectoid reaction

3. Peritectic reaction

4. Peritectoid reaction

4. Draw Iron -Carbide equilibrium diagram and mark on it all salient temperature and composition fields.

5. (1) Elements A & B melt at 7000° C and 10000° C respectively. Draw a typical isomorphous phase diagram between the elements A & 8

(2) Elements A & B melt at 7000° C & 10000° C respectively. They form a eutectic at 35%A at temperature 5000 C. Draw a typical phase diagram between A & B

6. Metal A has melting point at 10000° C . Metal B has melting point of 5000° C. Draw one phase diagram (between the elements A & B) for each of the following conditions. (i)The two elements exhibit unlimited solid solubility.

(ii)The alloy systems show formation of two terminal solid solution and a eutectic point at 50%A and at7000° C.

7. (i)Give the classification of steel.

(ii)Desirable properties and application of low, medium and high carbon steel.
(iii)What is an alloy steel? How are alloy steel classified? Explain them.

8. (i) Explain the classification of steel.

(ii)Desirable properties and application of GrayC.I, NodularC.I, WhiteC.I, MalleableC.I.

UNIT-II()

PART- A

1. What is meant by "heat treatment"? and its purpose.

2 .List the various stages of a heat treatment process.

3 .A low carbon steel in the normalized condition is stronger than the same steel in the

annealed condition. Why?

4. Case carburizing heat treatment is not generally carried out for medium carbon steel. Why? """"

5. What is "critical cooling rate" in hardening of steel?

6. What are the factors affecting the CCR?

7. What is the microstructure of an austempered of steel? What is the advantage of austempering heat treatment?

8. What is the principle of surface hardening in induction hardening process?

9. What is the need for providing a tempering treatment after quench hardening of steel?

10. What is meant by normalizing? and its purpose.

11. Differentiate between normalizing and full annealing.

12. Differentiate between full annealing and process annealing.

13. What is quenching? List some of the quenching medium.

14. What are the factors should be considered while selecting a quenching medium?

15. What are the factors affecting the hardness?

16. What is martempering and austempering?

17. What is meant by hardnability? What are the factors affecting it?

18. What is difference between hardness and hardnability?

19. In What way cyaniding differs from carburizing?

20. In What way flame hardening differs induction hardening?

UNIT-II()

PART-B

1. Define hardenability of steel .Explain the jominy end quench test used to determine

hardenability of steel. How will you draw hardenability curves this sheet?

2 Explain:

1. Annealing
2. Spheroidising
3. Normalizing
4. Hardening

3. (i) What are austempering and martempering ?What are their purpose?

   (ii)Explain the steps in Case carburizing of steel.

4. Write short notes on: 1. Carburizing 2.Nitriding 3.Cyaniding 4.Carbonitriding.

5. Write short notes on (a) Flame hardening (b) Induction hardening.

6. (i)Draw the schematic isothermal transformation diagram corresponding to 0.8% of carbon steel.
   (ii)Explain hardening and tempering process.

UNIT-III()

PART-A

1. What are the mechanical properties of materials?

2. Distinguish between elasticity and plasticity.

3. Distinguish between brittle fracture and ductile fracture.

4. What properties are determine from tensile testing of metallic products?

5. Define endurance limit in fatigue test.

6. In general HCP metals are hard and brittle while FCC metals are soft and ductile .Why?

7. Draw the sketch of a standard specimen used for charpy V-notch impact testing.

8. Distinguish between slip and twinning.

9. How will you express the deformation characteristics of a material through tensile testing?

10. What is meant by fatigue fracture?

11. What are factors affecting fatigue strength?

12. What is meant by creep fracture?

13. What are the factors affecting the creep?

14. What is the attractive feature of Vickers hardness test?

15. How does the Rockwell test differ from that of the others?

UNIT-III ()

PART-B

1. (a)What are slip and twinning? What are their characteristics?

   (b)Discuss characteristics of ductile fracture and brittle fracture.

2. Explain the testing procedure for determining the following properties. (i)Brinell hardness number (ii) Creep strength

3. Explain the testing procedure of

(i)Vickers hardness test (ii) lzod impact test

4. Explain the testing procedure of (i) Rockwell hardness test (ii) Charpy impact test

5. (a) Explain the mechanism of plastic deformation of metals by slip and twinning.
(b)Explain testing procedure for Fatigue test

6. Explain the testing procedure of (i) Tensile test (ii) Creep test

UNIT-IV()

PART-A

1. What are the effects of Cr and Mo in low alloy steels?

2. What are the effects of Mn and Si in low alloy steels?

3. What are the effects of V and W in low alloy steels?

~ 4. What is the purpose of magnesium treatment in producing S.G iron?

5. What is meant by precipitation hardening?

6. What is the main strengthening mechanism in high strength aluminum alloy?

7. What is meant by stainless steel?

8. How can you classify tool steel? and its properties

9. What are HSLA steel? Where are they used?

10. What are marageing steel? Give its composition.

11. What are the main difference between brass and bronze?

12. List the types of brass.

13. What are gunmetals? and its composition.

14. What is Babbitt t metal? and its composition.

15. What are cupronickels? What is the use of Monel metal?

16. List the bearing materials that are commonly used.

17. What are the characteristics of bearing materials?

UNIT-IV()

PART-B

1. Write short notes on: 1.Austinitic stainless steel

2. Ferritic stainless steel

3. Martensitic stainless steel

2. Write short notes on: 1. High speed steel

2. HSLA steel

3. Marageing steel

4. Tool steel

3. (i)What are ALPHA brass and ALPHA/BETA brass?

(ii)Discuss step involved in precipitation hardening treatment anyone aluminum alloy as example.

4. How will you classify brasses based on the composition of zinc Explain the properlies & application of the main type of brasses

5. Write short notes on:

    1. Gray C.I

    2. White C.I

    3. Malleable C.I

    4. Spheroidal graphite CI

6. Discuss the composition, properties & typical application of any four copper alloys

7. Discuss the composition, properties & typical application of some aluminum alloys

UNIT-V ( )

PART-A

1. What are polymers?

2. List out four attractive characteristics of polymers.

3. What is polymerization?

4. Differentiate addition and condensation polymerization.

5. Why are additives added to polymers? ';

6. Distinguish between thermoplastics and thermosetting plastics.

7. Name four ethenic polymers (polymers that have the basic monomers structure of ethylene).

8. Draw the molecular structure of polyethylene and poly propylene.

9 .Draw the molecular structure of phenol formaldehyde polymer (PF) and urea formaldehyde polymer (UF).

10. Give to example of particulate reinforced metal matrix composites and ceramic matrix composites.

11. What is the importance of alumina and silicon nitride?

12. What are the characteristics of engineering ceramics?

13. List the properties and application of PVC.

14. What are Bakelite's? and state their application.

15Nname any four engineering ceramics.

16. What are composites?

17. How are composites materials classified?

18. List the application of composite materials.

UNIT-V()

PART-B

1. Describe the molecular structure, properties and application of the following polymers.
   (i)Polyvinyl chloride (PVC) (ii)Polystyrene (PS)

   (iii)Polyethylene terephthalate (PET) (iv)Poly carbonate

2. Describe the molecular structure, properties and application of the following polymeric materials.

   (i)Poly methyl methacrylate (PMMA)

   (ii)Poly tetra f1uoro ethylene (PTFE)

   (iii)Polyethylene terephthalate (PET)

   (iv)Acryl nitride butadiene styrene.

3. Describe the molecular structure, properties and application of the following polymers.

   (i)Polypropylene (PP)

   (ii) Polyvinyl chloride (PVC)

   (iii) Poly tetra f1uoro ethylene (PTFE) (iv)Poly ethylene perethalate.

4. Describe the properties and application of the following ceramics materials
   (i)Alumina

   (ii)Silicon carbide

(iii)Silicon nitride

(iv)Sialon.

5. Write short notes about the different types of matrix materials and reinforced materials used to make polymers matrix composites.