KINGS
COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

Sub Code/Name: ME1253-Engineering Materials &Metallurgy

Year/Sem: II / IV

UNIT-I (Constitution of alloys and phase diagrams)
PART-A

1. Define Peritectic and Eutectoid reactions.

2. State the conditions under which two metallic elements will exhibit unlimited solid solubility.

3. Define the terms "ferrite" and "austenite" in iron-carbon alloy system.

4. Define solute and solvent.

5. What are the different types of solid solutions?

6. What is phase diagram? and its importance.

7. Define ferrite and austenite.

8. Define cementite, pearlite.

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

10. What are cooling curves?

UNIT-I (Constitution of alloys and phase diagrams)
PART-B

1. Discuss the similarities and differences between substitutional and interstitial solid solution? (16)

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? (16)

3. Explain:
    1. Eutectic reaction (4)
    2. Eutectoid reaction (4)
    3. Peritectic reaction (4)
    4. Peritectoid reaction (4)

4. Draw Iron -Carbide equilibrium diagram and mark on it all salient temperature and composition fields. (16)

5. (1) Elements A & B melt at 7000° C and 10000° C respectively. Draw a typical isomorphous phase diagram between the elements A & B.
(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. (16)

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. (16)

7. (i)Give the classification of steel. (2)
(ii)Desirable properties and application of low, medium and high carbon steel. (6)
(iii)What is an alloy steel? How are alloy steel classified? Explain them. (8)

8. (i) Explain the classification of steel. (4)
(ii)Desirable properties and application of GrayC.I, NodularC.I, WhiteC.I, MalleableC.I. (12)

UNIT-II (Heat treatment methods)
PART- A

1. A low carbon steel in tile normalised condition is stronger than tile same steel ill tile annealed condition. Why?

2. Case carburizing heat treatment is not generally carried out for medium carbon steels. Why?

3. What is "critical cooling rate" in hardening of steels?

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

5. What are the factors affecting the CCR?

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

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

8. What are the factors affecting the hardness?

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

10. What is induction hardening?

UNIT-II (Heat treatment methods)
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? (16)

2 Explain:

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

3. (i) What are austempering and martempering ?What are their purpose? (8)
(ii)Explain the steps in Case carburizing of steel. (8)

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

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 (Ferrous and Non-ferrous metals)
PART-A

1. Compare the martensite that is formed in maraging steels with the martensite that is formed in carbon steels.

2. What is the main strength mechanism in high strength aluminum alloys?

3. What are the effect of chromium and molybdenum in low alloy steels?

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

6.What is stainless steel?

7.What are the typesof stainless steel?

8.What are HSLA steel?

9.What are the types of cast irion?

10.What are the important copper alloys?

UNIT-III (Ferrous and Non-ferrous metals)
PART-B

1. Write short notes on: (i) Austinitic stainless steel (5)
   (ii) Ferritic stainless steel (5)
   (iii) Martensitic stainless steel(6)

2. Write short notes on: (i) High speed steel (4)
   (ii) HSLA steel c (4)
   (iii) Marageing steel (4)
   (iv) Tool steel (4)

3. (i) What are ALPHA brass and ALPHA/BETA brass? (8)
   (ii)Discuss step involved in precipitation hardening treatment anyone aluminum alloy as example. (8)

4. How will you classify brasses based on the composition of zinc Explain the properties & application of the main type of brasses. (16)

5. Write short notes on:
   (i) Gray C.I (4)
   (ii) White C.I (4)
   (iii) Malleable C.I (4)
   (iv) Spheroidal graphite CI(4)

6. Discuss the composition, properties & typical application of any four copper alloys. (16)

7. Discuss the composition, properties & typical application of some aluminum alloys. (16)

UNIT-IV (Non-Metallic materials)
PART-A

1. Name four ethenic polymers (polymers that have the basic monomer structure of ethylene).

2. What are the important of alumina and silicon nitride?

3. Give one example each for metal-matrix composites and ceramic-matrix composites.

4. What is polymerization?

5. Distinguish between thermoplastics and thermosetting plastics.

6. What are engineering ceramics?

7. What are the types of engineering ceramics?

8. What is composites?

9. List the advantage and limitations of composites materials.

10. List the applications composites materials.

UNIT-IV (Non-Metallic materials)
PART-B

1. Describe the molecular structure, properties and application of the following polymers.
   (i)Polyvinyl chloride (PVC) (4)
   (ii)Polystyrene (PS) (4)
   (iii)Polyethylene terephthalate (PET) (4)
   (iv)Poly carbonate (4)

2. Describe the molecular structure, properties and application of the following polymeric materials.
   (i)Poly methyl methacrylate (PMMA) (4)
   (ii)Poly tetra f1uoro ethylene (PTFE) (4)
   (iii)Polyethylene terephthalate (PET) (4)
   (iv)Acryl nitride butadiene styrene. (4)

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 (4)
   (ii)Silicon carbide (4)
   (iii)Silicon nitride (4)
   (iv)Sialon. (4)

5. Write short notes about the different types of matrix materials and reinforced materials used to make polymers matrix composites. (16)

UNIT-V (Mechanical properties and testing)
PART-A

1. Define endurance limit in fatigue test.

2. What properties are determined from tension testing of metallic products?

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

4. Define slip.

5. Define twinning.

6. What is a fracture?

7. Write types of fractures.

8. What is the use of S-N curve?

9. Define creep

10.Write down the various mechanical test.

UNIT-V (Mechanical properties and testing)

PART-B

1. (a)What are slip and twinning? What are their characteristics? (8)
   (b)Discuss characteristics of ductile fracture and brittle fracture. (8)

2. Explain the testing procedure for determining the following properties.

   (i)Brinell hardness number (8)

   (ii) Creep strength (8)

3. Explain the testing procedure of
   (i)Vickers hardness test (8)
   (ii) Izod impact test (8)

4. Explain the testing procedure of (i) Rockwell hardness test (8)
   (ii) Charpy impact test (8)

5. (a) Explain the mechanism of plastic deformation of metals by slip and twinning.(8)
   (b)Explain testing procedure for Fatigue test.(8)

6. Explain the testing procedure of (i) Tensile test (8)
   (ii) Creep test (8)