

## PH 8251 MATERIAL SCIENCE

### PART-B '16' Marks Important Questions

#### UNIT 1

- (i) What is solid solution? Discuss the Hume Rothery's rule for forming solid solution.  
(ii) Write short notes on substitutional and interstitial solid
- (i) How are solid solutions classified? Give example for each.  
(ii) Explain single component system. Discuss in detail about one component of iron with neat diagram.
- What is a eutectic phase diagram? Draw a typical equilibrium diagram for a eutectic type of system with limited solid solubility and explain its important features.
- What is a peritectic phase diagram? Draw a typical equilibrium diagram for a eutectic type of system with limited solid solubility and explain its important features.
- What are the microstructural changes that occur in a binary system?
- Explain in detail about the changes in microstructure during cooling with a neat diagram.

#### UNIT 2

- Describe the iron carbon equilibrium diagram with different phases that exist and the microstructure of slowly cooled steels.
- With the help of temperature- time- transformation (TTT) diagram of eutectoid steel, brief on The microstructure and properties of the following heat treatment process. Annealing, normalizing, quench.
- (i) Compare pearlitic and martensitic transformation.  
(ii) List the alloying of Si and Cr on properties and structure of steel.
- i) What are the micro constituents of iron carbon alloys? Explain the general characteristics of each?  
ii) Draw the typical microstructure of 1.2%C steel at 920°C 780 °C and 200 °C.
- Describe the structural changes that takes place when a steel containing a)0.76% C b) 0.022 to 0.76% C c) 0.76 to 2.14 % C are slowly cooled from the austenite region to room temperature.
- What are the different types of cast irons? Explain using a sketch.

#### UNIT 3

- Compare the engineering and true stress strain curves of mild steel. Also derive an expression for true stress and strain.
- (i) Write a short note on the different stages in a creep curve.  
(ii) Explain creep resistance materials with their properties.
- (i) Explain brinell hardness test with its advantages and limitations.  
(ii) Write a short note on Rockwell hardness test.
- Discuss in detail about Vickers microhardness test with its advantages and disadvantages.
- Discuss in detail about Knoop microhardness test with its advantages and disadvantages.

## UNIT 4

1. Discuss the domain structure in ferromagnetic materials. Show how the hysteresis curve is explained on the basis of domain theory
2. Discuss about electronic, ionic, orientational and space-charge polarizations with examples in detail.
3. (i). Explain the frequency and temperature dependence of all type of polarization in dielectrics.  
(ii). Differentiate the Type I and Type II superconductor's
4. (i). Give the detailed discussion on the various types of dielectric breakdown in dielectric materials.  
(ii). What are the remedies to avoid the breakdown mechanism.
5. Write an essay on different types of superconducting materials, their properties and their applications.
6. (i). What is ferroelectricity? Explain the properties of ferro electric materials.  
(ii). Mention any five applications ferro electric materials.

## UNIT 5

1. Name, explain the properties and applications of any four type of ceramics.
2. (i) Give the properties and uses of any one fibre reinforced composite and particle reinforced composite.  
(ii) State the law of mixtures in composites.
3. What is strengthening mechanism? Explain the strengthening mechanism of fibre reinforced composites
4. What are metallic glasses? Describe the preparation, properties and applications of metallic glasses.
5. What are shape memory alloys (SMA)? Describe the characteristics of SMA and its applications?
6. What are nanomaterials? Explain the properties and applications nanomaterials.
7. (i) Differentiate single wall and multiwall carbon nanotubes. Explain three different structure of SWNT  
(ii) list the properties and applications of CNT.