#### Shivaji University , Kolhapur Question Bank For Mar 2022 ( Summer ) Examination

 Subject Code : 73206
 Subject Name : Metallurgy

# Unit 1

- 1. What are Intermediate phases? What are the various types of Intermediate phases? Explain each in short.
- 2. What is Gibbs phase rule? Evaluate Degree of freedom (F) for a Solid solution alloy and a Eutectic alloy using cooling curves.
- 3. Draw a typical equilibrium diagram for impure / partial eutectic systems and explain the cooling and solidification of any hypoeutectic alloy from above melting temperature to room temperature and draw the room temperature structure.
- 4. Draw the crystal structures of FCC and HCP and evaluate the number of atoms per unit Cell for both.
- 5. Explain in detail the procedure to draw equilibrium diagram by thermal analysis method.
- 6. what is Gibbs phase rule? explain how this rule is modified for metallurgical system
- 7. sketch and explain BCC,FCC and HCP crystal structure
- 8. explain in short nucleation and green growth mechanism
- 9. what you mean by solid solution differentiate substitution and interstitial solid solution
- 10.explain in short different imperfections in crystal structure
- 11.explain what cooling curves are. draw different types of cooling curves and evaluate degree of freedom of anyone
- 12. what are Hume Ruthery rules for substitutional solid solution? Explain.
- 13. what is coring and Dendritic structure? explain with neat sketches

## Write short note on following

- a) Solid solution
- b) Coring
- c) Gibb's phase rule
- d) Coring and Dendrite structure
- e) intermetallic compounds
- f) nucleation and grain growth
- g) liver arm

# Draw self explanatory sketches of the following

- a) Substitutional and Interstitial solid solutions
- b) Coring and Dendrite structure
- c) FCC and BCC crystal structure

# Differentiate clearly between of the following

- a) Substitutional and interstitial solid solution.
- b) BCC and FCC structure,

- 1. Draw Iron Iron Carbide(Fe-Fe<sub>3</sub>C) Equilibrium diagram, along with all the reactions , phases, and temperatures.
- 2. What are steels? How steels are classified based on the basis of composition, structure, properties and applications? Draw typical microstructure and write the applications of each type.
- 3. Draw neat sketch of Cu Zn equilibrium diagram and explain different types of brasses.
- 4. Draw neat sketch of Al Si equilibrium diagram . With reference to equilibrium diagram explain the modification treatment.
- 5. Explain IAS BS and AISI specification for Steels
- 6. draw Cu-Zn equilibrium diagram? show variation of tensile strength and ductility with wearing amount of Zn in brass
- 7. Classified the cast iron?
- 8. why hypereutectoid Steels are harden from just above critical temperature while hypereutectoid steel are above upper critical temperature
- classify plane carbon Steels write down properties and applications of plain Carbon Steel
- 10. classify brassess and differentiate clearly between alpha and alpha beta brass

# Write short note on following

- a) Tool steels
- b) Water hardenable Tool steels
- c) Stainless steels
- d) Ferritic Stainless steels
- e) Berrilium bronzes.
- f) Cast Iron

- g) alpha beta brass,
- h) effect of Cr and Ni in stainless steel
- i) effect of allowing element in tool Steel
- j) composition and properties of heating element alloys
- k) beryllium bronze
- l) brasses
- m) cast iron
- n) Alloy steels

### Draw self explanatory sketches of the following

- a) Microstructures of 0.4 and 1.2 % carbon steel
- b) Microstructures of 70:30 brass as cast and annealed
- c) Microstructures of White and gray cast irons
- d) Microstructures of White and malleable cast irons
- e) Microstructures of  $\alpha$  and  $\alpha + \beta$  brasses.
- f) Sn-Sb equilibrium diagram
- g) Typical microstructures of medium and high carbon steel.
- h) microstructure of ductile cast iron
- i) typical micro structures of medium Carbon Steel and high Carbon Steel
- j) microstructures of white and grey cast iron
- k) micro structure of point 8% Carbon Steel
- 1) microstructure of nodular cast iron

### Differentiate clearly between of the following

a) Eutectic and Eutectic system,

1. Explain working principle and steps in Brunel hardness testing

### Write short note on following

- a) Ultra sonic Testing
- b) Rockwell hardness test.
- c) Stages in Dye Penetrant test.
- d) Impact Testing
- e) magnetic particle test
- f) radiographic test
- g) Eddy current test

# Draw self explanatory sketches of the following

- a) Magnetic particle test setup
- b) Creep test setup
- c) X-Ray radiography
- d) Gamma-Ray radiography
- e) Stress strain curve for mild steel and cast iron
- f) Charpy impact test setup,
- g) izod impact test setup,

# Differentiate clearly between of the following

- a) pulse echo and through transmission method,
- b) fatigue and creep testing

- 1. Give the classification of heat treatment furnaces. Explain any two types of furnaces with neat sketch.
- 2. Explain in detail the procedure to draw TTT diagram for eutectoid steel. Discuss the effect of alloying elements on TTT diagram.
- 3. Explain in detail the transformation of Austenite to Pearlite.
- 4. Explain the procedure to draw CCT diagram for 0.8 % carbon steel. Compare CCT diagram with TTT diagram.
- 5. Explain the mechanism of transformation austenite into upper and lower bainite
- 6. Draw CCT diagram overlap on TTT diagram and explain its significance
- 7. Explain transformation process of austenite into martensite

## Write short note on following

- a) heat treatment furnaces
- b) Austenite to pearlite transformation
- c) controlled atmosphere

# Draw self explanatory sketches of the following

- a) transformation of pearlite into Austenite
- b) salt bath furnace,
- c) Pit type heat treatment furnace

# Compare and contrast of the following.

- a) TTT diagram and CCT diagram.
- b) Bainite and Martensite.
- c) Pearlite and Ferrite
- d) Bainitic Transformation.

- 1. Explain tempering heat treatment along with the structural changes involved in it
- 2. Explain mechanism of quenching and quenching baths
- 3. What is annealing heat treatment ? Mention the purposes of annealing . Explain any two types of annealing in detail
- 4. What is heated treatment? What are the various purposes of heat treatment.
- 5. What is precipitation hardening? explain with neat sketch process of precipitation hardening for Al-Cu
- 6. What is flame hardening? and what are its advantages, limitations and applications
- 7. What are the various types of flame hardening
- 8. what is heat treatment? Write important types of heat treatment carried out on steels
- 9. what is carburizing? what are its types ?
- 10.Explain liquid carburizing with neat sketch and write its advantages and limitations
- 11.Explain various steps of heat treatment and the purpose of each step
- 12.what is annealing and what are the purposes of annealing? explain any two types of annealing with their purpose
- 13. what is tempering? what are the purposes of tempering?
- 14. what is nitriding? what are the different types of nitriding? explain any one

### Write short note on following

- a) Induction Hardening
- b) Sub zero treatment
- c) Salt bath furnace and air furnaces.
- d) Heat treatment defects
- e) Tempering,
- f) Austempering,
- g) Martempering
- h) Carburizing,
- i) Mechanism of quenching

#### Draw self explanatory sketches of the following

a) setup for flame hardening

### Differentiate clearly between of the following

- b) Annealing and Normalising.
- c) Annealing and Tempering process
- d) Austempering and Martempering .
- e) Nitriding and Cyaniding.
- f) Flame hardening & Induction hardening.
- g) Hardening and Tempering
- h) curborizing and nitriding
- i) surface hardening and case hardening
- j) nitrating and carburizing

- 1. Draw Flowchart for manufacturing of self lubricating bearings? Explain why oil impregnation is must in this process?
- 2. Draw Flowchart for carbide cutting tools manufactured by powder metallurgy techniques, why pre-sintering is necessary in such tools?
- 3. explain with net sketch process of compacting in powder metallurgy and write its purposes
- 4. Write classification and various types of powder manufacturing. Write process of powder manufacturing of any two types
- 5. what is sintering and what are it purposes

### Write short note on following

- a) Compacting and sintering
- b) Self lubricating bearing.
- c) Liquid phase sintering.
- d) Methods of powder manufacturing
- e) sintering

# Draw self explanatory sketches of the following

- a) Flow chart for manufacturing of diamond impregnated tools.
- b) Y cone type powder mixer

# Differentiate clearly between of the following

a) compacting and sintering