

19ME303

ENGINEERING MATERIALS AND METALLURGY

DEPARTMENT OF MECHANICAL ENGINEERING

IMPORTANT EMM QUESTION BANK

UNIT I -ALLOYS & PHASE DIAGRAMS

- 1.How Are Solid Solutions Classified? Give Examples For Each.
- 2.Explain The Following Invariant Reactions With Reference To A Phase Diagram:
- 3.(A) Eutectic Reaction, (B) Eutectoid Reaction,(C) Peritectic Reaction, And (D) Peritectoid Reaction.
- 4.What Are The Micro-Constituents Of Iron- Carbon Alloys? Explain The General Characteristic Of Each.
- 5.Draw Iron-Iron Carbide Equilibrium Diagram And Mark On It All Salient Temperatures And Composition Fields
- 6.Explain The Primary Crystallisation Of Eutectoid Steels, Hypoeutectoid Steels, And Hypereutectoid Steels
- 7.Explain the different types of cooling curves.

UNIT II HEAT TREATMENT

- 1.Compare And Contrast The Process Of Full Annealing, Process Annealing, Stress Relief Annealing, Recrystallisation, Annealing, And Spheroidise Annealing.
- 2.(a)What Do You Understand By Isothermal Transformation?

(b) What Are Ttt Diagrams?

(c) How A Ttt Diagram Is Drawn?

(d) Draw A Neat Sketch Of The Ttt Diagram For A Eutectoid Steel And Label The Regions,. Mark V The Different Products Formed On This Diagram

3. Define Hardenability And Explain Jominy End Quench Test . How To Use This Jominy End Quench Test Data?

4. Explain The Process Of Martempering Compare And Contrast It With Austempering Process.

5. Explain The Following Case Hardening Process Briefly With Neat Sketch.

A. Carburising

B. Nitriding

C. Cyaniding

D. Carbonitriding

6. Explain The Flame And Induction Hardening With Neat Sketch.

7. Explain The Ccr Diagram With Neat Sketch.

UNIT III FERROUS AND NON FERROUS METALS

1. (a) Give the classifications of steels

(b) Describe the properties and typical applications of low medium, and high- carbon steels;

(c) What is an alloy steel? how are alloy steels classified? Explain them.

2. Write down the composition, properties and applications of the following metals. (1) Grey cast iron (2) white cast iron

(3) nodular cast iron (4) malleable cast iron

3. Write short notes on Particle reinforced composites and fiber reinforced composites.

4. (a) What are the main classifications of stainless steels?

(b) Discuss the different types of stainless steel, making reference to approximate compositions, structures, heat treatments.

5. Explain the composition, properties, and typical applications for any five types of Aluminium alloys

6. (a) Explain the principle characteristics of cast iron and explain the factors which affect the structure of cast iron

(b) Describe the structures of the main types of cast irons and account for their continued use as engineering materials

c) Compare grey and malleable cast irons with respect to (i) composition and heat treatment, (ii) microstructure, and (iii) mechanical characteristics.

(d) Compare white and nodular cast irons with respect to (i) composition and heat treatment, (ii) microstructure, and (iii) mechanical characteristics.

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7. Explain the following non ferrous metals.

a. Brass

b. Bronze

c. Cupronickel

d. Aluminium

e. Bearing alloys

8. State the effect of the following alloying elements in steel.

i) Cr ii) Mo iii) Mn iv) Vd v) Wn vi) Ti

9. Explain with a neat sketch the process of precipitation heat treatment.

UNIT IV NON METALLIC MATERIALS

1. (a) What do you understand by polymerization? With the help of suitable examples, compare and contrast condensation polymerization.

(b) Describe the difference between thermoplastics and thermosetting plastics.

(c) Explain the difference between commodity plastics and engineering plastics

2. Write Short notes on PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE polymers.

3. With suitable applications explain the following ceramic materials.

i) Alumina, Silica, Silicon carbide, Silicon nitride

4. What are Ceramics? List and briefly explain five important properties of Ceramics that make them useful engineering materials.

5. What is the Distinction between matrix and dispersed phases in a Composite material?

6. i) What is the difference between addition polymerization and condensation polymerization.

ii) What are the factors affecting mechanical properties of a material.

7. Explain the types of homopolymers and copolymers.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION

MECHANISMS

1. Explain The Two Modes Of Plastic Deformation In Metals With Neat Sketches.

2. (a) Critically Compare The Deformation By Slip And Twinning

(b) Derive An Expression For Critical Resolved Shear Stress In Material Subjected To Uni- Axial Tensile Loading. Also Distinguish Between Shear Stress And Critical Resolved Shear Stress.

3. What Is Brittle Fracture? Explain The Griffith's Theory On Brittle Fracture And Deduce And Expression For The Critical Stress Required To Propagate A Crack Simultaneously In A Brittle Material.

4. What Is Meant By Ductile Fracture? Explain The Mechanism Of It. 5 Explain The : (I) Fatigue Fracture, And (Ii) Creep Fracture With Neat Sketch.

6. Explain The Procedure Of Jominy End Quench Test.

7. Explain With A Neat Sketch Precipitation Hardening.

6. (a) Describe A Tensile Test To Determine Various Tensile Properties

(b) Explain The Testing Procedure Of (i) A Compression Test, And (ii) A Shear Test

7. Draw The Sn Curve For Ferrous And Non Ferrous Metals And Explain How Endurance Strength Can Be Determined . Also Discuss The Factors That Affect The Fatigue Life.

8. What Are The Different Types Of Fracture In Metallic Materials? Give The Important Feature Of These Fractured Surface . What Is The Use Of This Study?

9. Explain Brinell Hardness Testing And Its Applications.

10 Discuss Fatigue Test For A Metallic Material. What Is S-N Diagram

11. Why Impact Test Are Important ? Explain Any One Impact Test?

12 .i) Explain the testing procedure for Vickers hardness testing.

ii) Explain the testing procedure for Charpy impact testing.
