# G.P JAJPUR

## MECHANICAL DEPARTMENT

## QUESTION BANK

## ENGINEERING MATERIALS(Th-3), 3RD SEMESTER

## MODULE 1

### ENGINEERING MATERIALS AND THEIR PROPERTIES

***SHORT ANSWER TYPE QUESTIONS (2 MARKS)***

1. How engineering materials are classified?
2. Give two examples each of ferrous and non-ferrous materials.
3. Define material reliability and safety.
4. Define ductility and brittleness.
5. Define malleability.
6. What is the difference between ferrous and non-ferrous metal?
7. What do you mean by toughness and hardness?

***SHORT ANSWER TYPE QUESTIONS (5 MARKS)***

1. Briefly classify engineering materials into ferrous and non-ferrous category.
2. What are the factors affecting the selection of material?
3. Describe two physical and three chemical properties of engineering material.

***LONG ANSWER TYPE QUESTIONS (8 MARKS)***

1. Briefly describe various mechanical properties of engineering materials.
2. Explain the characteristics of engineering materials with examples.

# MODULE 2

## FERROUS MATERIALS AND ALLOYS

### *SHORT ANSWER TYPE QUESTIONS (2 MARKS)*

1. What is the difference between Cast Iron and Pig Iron?
2. List types of ferrous metal.
3. What is an alloy?
4. Write down uses of stainless steel.
5. Explain the term Hardenability of steel.
6. What is the difference between Iron and Steel?
7. What is the composition of stainless steel?
8. Write down the uses of stainless steel.

### *SHORT ANSWER TYPE QUESTIONS (5 MARKS)*

1. Write down the composition properties and application of High Carbon Steel.
2. Briefly explain the composition, properties and application of mild steel.
3. What is alloy steel? State the composition and properties of stainless steel.
4. What are the alloying elements in formation of tool steel? Explain their properties in brief.
5. Is Cast-Iron an alloy? Mention its physical properties and application.
6. Explain the hardenability of steel.

### *LONG ANSWER TYPE QUESTIONS (8 MARKS)*

1. State the composition of low carbon, medium carbon and high carbon steel and explain the effect of following alloying elements in steel.
   Cr, Mn, Ni, V, Mo, W.
2. Explain effect of various alloying elements on steel properties.
3. What do you mean by tool steel? Mention its type and explain various alloying elements for specific use of tool steel.

# MODULE 3

## IRON-CARBON SYSTEM

***SHORT ANSWER TYPE QUESTIONS (2 MARKS)***

1. What is a phase diagram?
2. What is cooling curve?
3. What is an eutectic reaction?
4. What is an eutectoid reaction?

***SHORT ANSWER TYPE QUESTIONS (5 MARKS)***

1. What is phase and phase diagram?
2. Explain the concept of phase diagram and cooling curve.
3. Draw the cooling curves for a material and explain.
4. What do you mean by invariant reaction? Write down invariant reactions in Fe-C equilibrium diagram.

***LONG ANSWER TYPE QUESTIONS (8 MARKS)***

1. Explain the Iron-Carbon equilibrium diagram with salient micro constituents of iron and steel in different phases.
2. With neat sketch explain Iron-Carbon equilibrium diagram.

# MODULE 4

## CRYSTAL IMPERFECTIONS

### *SHORT ANSWER TYPE QUESTIONS (2 MARKS)*

1. What is the average number of atoms in BCC, FCC and HCP crystal?
2. Define a crystal and ideal crystal.
3. What do you mean by ideal crystal?
4. What is point defect?
5. What is line defect?
6. What is dislocation?
7. What is slip?
8. What is twinning?

### *SHORT ANSWER TYPE QUESTIONS (5 MARKS)*

1. What do you mean by atomic packing factor? Derive APF for BCC and FCC.
2. Classify crystal imperfection. State the effect of deformation on material properties.
3. What is the reason of point defects? Classify the point defects and give the reason how they are formed.
4. Explain different types of point defects.
5. State various causes of dislocation.
6. Explain various properties changes by deformation.
7. What are the different types of crystal imperfection?
8. Differentiate between slip and twinning.

### *LONG ANSWER TYPE QUESTIONS (8 MARKS)*

1. What is line defect? With neat sketch explain Edge dislocation and Screw dislocation.
2. With neat sketch explain the deformation by slip and twinning.
3. What are the effects of imperfection on material properties?
4. Explain the all property changes by deformation.
5. Explain all the point defects.
6. Explain line and screws dislocation.
7. Explain different types of dislocation and state its causes.

# MODULE 5

## HEAT TREATMENT

### *SHORT ANSWER TYPE QUESTIONS (2 MARKS)*

1. What is heat treatment process?
2. Name various heat treatment processes.
3. What do you mean by tempering?
4. Explain why tempering follows hardening?
5. What is hardening?
6. Define annealing.

### *SHORT ANSWER TYPE QUESTIONS (5 MARKS)*

1. Write down any five the purposes of heat treatment. What are different types of heat treatment processes?
2. Explain the objective of heat treatment.
3. What is cyaniding process of hardening? Write down its characteristics.
4. Explain age hardening and surface hardening.
5. Explain advantages and disadvantages of Annealing and Normalizing.
6. Why hardening is followed by tempering? Briefly describe the various tempering processes.
7. Explain the hardenability of steel.
8. List effects of heat treatment on properties of steel.

### *LONG ANSWER TYPE QUESTIONS (8 MARKS)*

1. Explain surface hardening process and briefly explain about Carburizing and Nitriding.
2. Describe the following heat treatment processes.

(i) Annealing (ii) Normalizing

3. Explain Carburizing heat treatment process.

4. What do you mean by Carburizing? Explain how it is obtained.
5. Explain in details about the various surface (case) hardening processes.
6. Explain in brief the following heat treatment processes :
   (i) Annealing
   (ii) Normalizing
   (iii) Hardening
   (iv) Tempering
7. Describe and elaborate various heat treatment methods.

## MODULE 6

## NON-FERROUS ALLOYS

***SHORT ANSWER TYPE QUESTIONS (2 MARKS)***

1. Write the composition of bronze.
2. Write the composition of Muntz metal and Cartridge brass.
3. Write down any two properties of copper alloys.
4. Give two examples of Non-ferrous alloys.
5. Name any four non-ferrous alloys.
6. Name two copper alloys with their constituents and percentage.
7. What is the composition of brass?
8. What is Babbitt metal?
9. Give composition of duralumin.

***SHORT ANSWER TYPE QUESTIONS (5 MARKS)***

1. Give some examples of Nickel alloy. Write down preparation of Inconel.
2. Write the properties and typical applications of various Nickel Alloys.
3. Write down the composition, properties and uses of Wrought Copper and Brasses.
4. State the composition and uses of Babbitt metal.
5. Describe composition, properties and application of ‘duralumin’.
6. State the composition and properties of Duralumin and Y-alloy.

7. What is the composition of Duralumin? Write its properties.
8. Describe composition, properties and application of Zinc alloys.

***LONG ANSWER TYPE QUESTIONS (8 MARKS)***

1. Describe the composition properties and use of various Alluminium alloys.

## MODULE 7

## BEARING MATERIALS

***SHORT ANSWER TYPE QUESTIONS (2 MARKS)***

1. Give classification of bearing materials.
2. What is the basic characteristics of a bearing material?

***SHORT ANSWER TYPE QUESTIONS (5 MARKS)***

1. Describe the composition, properties and uses of tin based bearing material.
2. What is a bearing material? Explain the composition, properties and uses of a Cu-base bearing material.
3. Explain the composition, properties and uses of Cadmium-base bearing material.

## MODULE 8

## SPRING MATERIALS

***SHORT ANSWER TYPE QUESTIONS (2 MARKS)***

1. Write types of spring materials.
2. Give example of spring materials.
3. What is an iron based spring material?
4. Write down any two properties of iron based spring material.
5. What is copper based spring material?
6. Write down any two properties of copper based spring material.

***SHORT ANSWER TYPE QUESTIONS (5 MARKS)***

1. Write the composition, properties and use of an Iron-base spring material.
2. Mention the properties of Iron-base spring material.

3. Write the composition, properties and use of a Copper-base spring material.
4. Mention the properties of Copper-base spring material.

## MODULE 9

## POLYMERS

***SHORT ANSWER TYPE QUESTIONS (2 MARKS)***

1. What is thermosetting polymer? Give examples.
2. What is thermoplastic polymer? Give examples.
3. What is an elastomer? Give example.

***SHORT ANSWER TYPE QUESTIONS (5 MARKS)***

1. What do you mean by Polypropene? Write down its properties and uses.
2. What is polymerization process? Classify the polymerization process.
3. Explain the properties and application of thermosetting polymers.
4. Explain the properties and application of thermoplastic polymers.
5. Write down any five properties of elastomers.

***LONG ANSWER TYPE QUESTIONS (8 MARKS)***

1. Differentiate between thermosetting and thermoplastic polymer. Write down the application of these polymer.

## MODULE 10

## COMPOSITES AND CERAMICS

***SHORT ANSWER TYPE QUESTIONS (2 MARKS)***

1. What is composite material?
2. Classify composite materials.
3. Define composites and alloys and give two examples of each.
4. What is an alloy?
5. Name the alloys for high temperature service.
6. What is particle reinforced and fiber reinforced composites?
7. Write any two application of ceramic.

***SHORT ANSWER TYPE QUESTIONS (5 MARKS)***

1. Explain particle-reinforced and fiber-reinforced composites and their properties.
2. Explain fiber reinforced composites with their application.
3. Mention the present day uses of ceramics.