



- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Diagrams and chemical equations should be given whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Discuss the classification properties and applications of Engineering Materials. 7
- b) Define the terms (a) Space Lattice (b) Unit Cell. Name the important crystal structure for metals. Draw neat sketch of any one. 6
- OR
2. a) What are the various Imperfections found in crystal structures? Explain in brief. 7
- b) What is Plastic deformation? Explain slip mechanism in details with suitable sketch. 6
3. a) What is Nucleation? Differentiate between homogeneous and heterogeneous nucleation. 7
- b) Define Solid Solution. Explain Hume Rothery rule for formation of substitutional solid solution. 7
- OR
4. a) Draw Iron – Iron – Carbide Equilibrium diagram. Show all detail's on it. 8
- b) Explain Three invariant reaction in Iron – Iron carbide diagram. 6
5. a) What is Heat treatment? Explain Normalizing process in details. 7
- b) Explain Jominy End Quench test to determine the hardenability of steel. 6
- OR
6. a) Draw and Explain TTT diagram for 0.8% C eutectoid steel and show following processes on it. 8
- 1) Martempering
  - 2) Austempering
  - 3) Patenting
- b) What is Retained Austenite? How is it Eliminated? Explain. 5

7. a) What is plain carbon steel? Classify it in details.

b) What are the effects of adding alloying elements. Nickel, Chromium, Manganese, Tungsten on the properties of steel.

OR

8. Write short notes on any three.

a) High Speed Steel.

b) Red Hardness.

c) Maraging Steel.

d) Hadfield Manganese Steel.

9. a) Explain classification of cast iron in detail.

b) Explain microstructure and characteristics of gray cast iron & give its uses.

OR

10. a) Explain Ni – Hard and Ni – Resist Cast iron with properties and applications.

b) Draw and Explain Cu – Zn Diagram in brief. Explain in detail.

11. a) Define Non – Destructive testing. Explain Ultrasound Test.

b) Explain in detail the determination of hardness using Rockwell Hardness Tester.

OR

12. a) Define Powder Metallurgy. Explain the various steps involved in manufacturing products by using Powder Metallurgy.

b) Give the advantages and Limitations of the Powder Metallurgy.