



- 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) How the engineering materials are classified? Mention mechanical properties of it. **9**
b) Differentiate between microscopic & macroscopic examination of materials. **4**

OR

2. a) Draw Schematic diagram of F.C.C. Crystal structure and calculate packing efficiency for it. **7**
b) Define plastic deformation. Explain slip & twinning in brief. **6**
3. a) Define solid solution. Explain its various types. **7**
b) Explain Hume Rothery rules. **6**

OR

4. a) Draw Iron - Iron carbide equilibrium diagram show all details on it. **7**
b) Describe three invariant reactions in Fe-Fe₃C equilibrium diagram. **6**
5. a) Define Heat Treatment. What are the various types of it? Explain any one in brief. **7**
b) Define Hardenability. Explain Jominy End Quench test to find out Hardenability. **7**

OR

6. a) Draw and explain T-T-T curve in brief. **7**
b) Explain flame hardening and induction hardening process with neat sketches. **7**
7. a) What are stainless steels? Give detailed classification and application of stainless steel. **7**

b) What are the effect of addition of 'Nickel' and 'Chromium' on the properties of steel. 6

OR

8. a) What do you understand by Red hardness? How is it achieved in H.S.S.? 7

b) Write short on **any two**. 6

i) Hadfield Manganese Steel.

ii) O. H. N. S. Steel.

iii) Maraging Steel.

9. a) What is white Cast Iron? Why it is brittle? Explain how it is converted into malleable cast iron. 7

b) Define brass. What are the various types of brasses? Mention their applications. 6

OR

10. a) Draw Cu - 50% Zn. diagram and explain it in brief. 7

b) Explain the variation in the mechanical properties of brasses with respect to zinc content. 6

11. a) Explain in detail the determination of hardness using Brinell Hardness Tester with advantages and industrial applications. 7

b) Define non - destructive test. Explain ultrasound testing on materials. 7

OR

12. a) Define Powder Metallurgy. State the advantages and limitations of powder metallurgy. Technique. 7

b) Explain the compaction process involved in powder metallurgy in details. 7
