

- N.B. :** (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Illustrate answers with neat **sketches**.
(4) **Figures** to the **right** indicate **full** marks.
1. (a) What are point defects ? Illustrate with neat sketches the various types of point defects. 10
(b) Draw fully labelled Fe-Fe₃C diagram indicating critical points and temperatures. Write the three important transformations seen in the diagram. 10
 2. (a) Explain slip mechanism of plastic deformation. What is critical resolved shear stress ? Derive its expression for deformation by slip. 10
(b) Define creep. Draw classical creep curve. Explain each step in detail. 10
 3. (a) Define fracture. Explain brittle, ductile, creep and fatigue fracture. 10
(b) What is recrystallization annealing ? Discuss various stages of recrystallization annealing in detail. What are the factors affecting it ? 10
 4. (a) Discuss the following heat treatment processes :- 10
(i) Normalising
(ii) Tempering
(iii) Austempering.
(b) Discuss case hardening process of 'nitriding' in detail. 10
 5. (a) Discuss hot and cold working theory. Explain their advantages, limitations and applications. 10
(b) Discuss the advantages of alloying elements. Explain the significance of any four alloying elements in plain carbon steel. 10
 6. (a) Explain the following :- 10
(i) Aluminium based alloys
(ii) Copper based alloys.
(b) Define fatigue failure. Explain fatigue testing and interpretation of S-N curve. 10
 7. Write short notes on any **four** of the following :- 20
(a) Hardenability
(b) High speed steels
(c) Creep resistant materials
(d) Atomic packing factor of BCC lattice
(e) Induction hardening
(f) Precipitation hardening.