Time : Three Hours   Maximum : 100 Marks

Part A

Answer *all* questions

1. What are the different types of point defects in solids?

2. Draw cooling curve of a pure metal.

3. State Fick's I law.

4. What are the two types of solid solutions?

5. What is an invariant reaction?

6. Which are the softest and hardest microconstituents in Fe-C alloy system?

7. What is martempering?

8. What is meant by duplex steels?

9. List few applications of Magnesium alloys.

10. What is a composite?   (10x2= 20 marks)

Part B

Answer any *ONE* from each module.

Module I

11. a) Explain specimen preparation techniques for microscopic examination.   (12 marks)

    b) What is strain hardening? How it is relieved?   (8 marks)

Or

12. a) Explain the two types of dislocations with neat sketches.   (12 marks)

    b) Explain *Schmid's law*   (8 marks)

Module II

13. a) Draw the Pb-Sn phase diagram and explain the development of microstructure for an alloy of 25% Sn and 75%Pb.   (15 marks)

    b)Write down the Hume – Rothery rules for solid solutions.   (5 marks)

Or

14. a) State lever rule. Explain with an example.   (10 marks)

    b) Explain the Griffith's theory of brittle fracture   (10 marks)

Module III

15. a) Explain hardening of low carbon and medium carbon steel with reference to their TTT diagrams.

                                                        (10 marks)

b) Explain the processes of CVD and PVD (10 marks)

Or

16. a) Draw the Fe-Fe$_3$C phase diagram, mark the different phase fields and explain the three invariant reactions involved. (15 marks)

 b) What is hardenability? How it is assessed? (5 marks)

Module IV

17. (a) Write short note on Gray cast iron, SG iron, Malleable iron and white iron. (12 marks)

   (b) Explain the stir casting process used for manufacturing metal matrix composites   (8 marks)

Or

18. (a) Write in detail about properties and applications of any two copper alloys. (10 marks)

   (b) Write short notes on Nano materials and Smart materials.   (10 marks)

(4x20= 80 marks)