

## **Subjective questions on MET-09**

- Q1. How can we classify the engineering materials and what are the criteria for selection of materials for engineering purpose?
- Q2. What are the mechanical properties of metals, explain them in brief?
- Q3. What do you understand by the term phase diagram and what are their objectives?
- Q4. Classify various types of phase diagrams and define the following:
- a) System
  - b) Component
  - c) Solubility limit
  - d) Phase
- Q5. What is the Gibb's phase rule, define the terms: solidus and liquidus.
- Q6. Explain in detail the procedure for construction of phase diagram.
- Q7. Draw the cooling curves for:
- a) Pure Metal
  - b) Binary Solid solution
  - c) Binary electric solution
- Q8. State and prove levers rule and what is the significance of the same?
- Q9. How will you apply Gibb's phase rule to determine degree of freedom in the phase diagram?
- Q10. Derive the degrees of freedom for a system which has equal number of components and phases.
- Q11. What do you understand by the term allotropy, explain in reference with iron & draw the cooling curve for pure iron?
- Q12. Draw neat and labeled iron cementite phase diagram, what are the various reactions taking place in iron cementite phase diagram. Write the equations of reaction.

Q 13. Explain briefly transformation of following alloys

- a) 0.4 % Carbon
- b) 0.8% Carbon
- c) 1.2% Carbon

Q14. Explain briefly the construction of T-T-T diagrams.

Q15. Explain briefly the mechanism of:-

- a) Realistic transformation
- b) Bainitic transformation
- c) Martensitic transformation

Q16. Compare the properties and microstructures of various micro constituents of iron carbon system.

Q17. Write short notes on:

- a) Full annealing
- b) Process annealing
- c)

Q18. Explain hardening process in detail.

Q19. What is normalizing, explain and differentiate normalizing and annealing.

Q20. What are different quenching media for hardening process.

Q21. What is surface hardening and what are different surface hardening processes.

Q22. What are the limitations of plain carbon steels and what do you accomplish by adding alloying elements to steel.

Q23. Briefly explain the classification of alloying elements.

Q24. Write the purpose of alloying

Q25. Explain the effect of following allowing elements in steel:

- a) Chromium
- b) Silicon
- c) Manganese

Q26. Explain the effect of following allowing elements in steel:

- a) Vanadium
- b) Tungsten
- c) Copper

Q27. What is aluminum and write short description of aluminum alloys and their uses.

Q28. What is copper and write short description of copper alloys and their uses.

Q29. What are the properties required in a bearing material, what are different bearing materials and what are their properties?

Q30. What are the physical and mechanical properties of non ferrous metals and their applications.

Q31. Define the term heat treatment and state its objectives.

Q32. List the various heat treatment process.

Q33. Differentiate between:

- a) Process annealing and recrystallization annealing
- b) Diffusion annealing and spheroid zing

Q34. Describe the process annealing and full annealing.

Q35. What is normalizing? Give the temperature ranges of hypo and hyper eutectoid steel. What are the main aims of normalizing?

Q36. Differentiate between normalizing and annealing & explain why normalizing results in more uniform structure than annealing.

Q37. Discuss merit and demerits of following hardening processes:

- a) Direct quenching
- b) Interrupted quenching

Q38. Explain briefly the theory of tempering & what is its purpose?

Q39. Describe following processes:

- a) Sub zero treatment
- b) Patenting

Q40. Write short notes on:

- a) Age hardening heat treatment
- b) Stress relieving