

22449

22223

3 Hours / 70 Marks

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any FIVE of the following:** **10**
- a) Draw a figure of dendritic structure and state the reason of its formation.
 - b) Draw the figure of
 - i) Point imperfection and
 - ii) Line imperfection
 - c) State the meaning of binary equilibrium diagram.
 - d) State the composition of Naval brass.
 - e) State the importance of heat treatment.
 - f) State reason that hardening is always followed by tempering.
 - g) State the importance of powder metallurgy.

P.T.O.

- 2. Attempt any THREE of the following:** **12**
- a) State Hume Rothery's rule for solid solution.
 - b) Explain the concept of
 - i) coordination number and
 - ii) packing efficiency with suitable figure
 - c) Describe the mechanism of crystallization. Explain the effect on end structure if the nucleation rate is more than the growth rate.
 - d) Identify and draw crystal structure for iron and nickel.
- 3. Attempt any THREE of the following:** **12**
- a) Explain the procedure of plotting the equilibrium diagram.
 - b) Draw the cooling curves of pure metal and alloy and state the point of difference in them.
 - c) Explain with neat sketch equilibrium diagram for eutectic system.
 - d) A binary alloy of A and B has complete solid solubility. For an overall composition containing 73% B, the liquid composition containing 57% B and the solid composition having 82% B are in thermal equilibrium. Melting point of A is 2050°C and of B is 2300°C. Draw the phase diagram and determine the relative amounts of solid and liquid phases using lever rule.
- 4. Attempt any THREE of the following:** **12**
- a) Draw a neat and well labelled TTT diagram for eutectoid steel.
 - b) State two similarities and two differences between annealing and normalizing.
 - c) State reason that martensitic phase cannot be seen on iron-carbon equilibrium diagram. Also explain the process of martensitic transformation.
 - d) Suggest and explain suitable heat treatment process for the gears of high power transmission system.
 - e) State the merits and demerits of powder metallurgy.

5. Attempt any TWO of the following:**12**

- a) Draw well labeled iron-carbon equilibrium diagram and show the region of low, high carbon steel and hypo, hyper eutectoid steel on it.
- b) State the properties and applications of
 - i) High speed steel
 - ii) Heat resisting steel and
 - iii) Stainless steel
- c) Suggest suitable material considering the properties required in following application
 - i) Valve stem, condenser tubes
 - ii) light weight structural components like roofs and walls of building
 - iii) manhole covers and pipes. Justify your answer.

6. Attempt any TWO of the following:**12**

- a) State the composition, properties and applications of
 - i) Babbit metal and
 - ii) Duralumin
 - b) Describe the steps followed in powder metallurgy.
 - c) Explain the powder manufacturing processes used for powder metallurgy products.
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