

Exam.Code:1030
Sub. Code: 7858

1059
M.Tech. (Material Science and Technology)
Second Semester
MST-203: Solid State Phase Transformation

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

- I. Answer the following briefly:
 - a) What is the difference between continuous and discontinuous phase transformation?
 - b) Explain the engineering advantages of ductile cast iron over other ferrous alloys.
 - c) What limits the minimum interlamellar spacing in eutectic?
 - d) What is Aluminum Bronze? What are its special features?
 - e) What is the effect on microstructure in metal forming process? (5x2)

UNIT - I

- II. a) Draw schematic phase diagrams for binary systems with
 - i) complete liquid and solid solubility
 - ii) complete liquid but zero solid solubility
 - iii) complete liquid and limited solid solubility. (In your sketches label phase fields and give characteristic temperatures.)
- b) What is constitutional super-cooling? When does this take place?
- c) What are the important characteristics of the second order transformations? (5,3,2)
- III. a) What impact does the radius of curvature of particles interface of the precipitating phase have on its free energy and what is its impact on the equilibrium solubility of a dissolved component in the master phase?
- b) Distinguish between (i) an intermediate phase and (ii) an intermediate compound.
- c) In general will the length scale of the phases be larger in a eutectic or a eutectoid microstructure. Why? (5,2,3)
- IV. Derive an expression for solute concentration just ahead of a planar solidification front moving a constant velocity in a binary isomorphous alloy in absence of any convection current in liquid and diffusion in solid. (10)

P.T.O.

(2)

UNIT - II

- V. a) Describe the process of steel hardening. Why steels are required to be tempered after it has been hardened?
- b) Differentiate between hot and cold working of metals. Bring out the advantages and disadvantages of each of these techniques. (2x5)
- VI. a) What are engineering plastics? Discuss importance of heat deflection temperature in selecting engineering applications of plastics.
- b) Explain the principle of indirect electric arc furnace for the melting of grey cast iron. (2x5)
- VII. a) What is Duralumin? Mention its properties and its applications.
- b) What do you mean by die casting? Explain the hot chamber die casting. (2x5)

x-x-x