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Fourth Semester B.E. Degree Examination, June/July 2015
Material Science and Metallurgy

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.**
2. Use of Handbook / Charts / Tables etc are not required.

PART - A

- 1 a. What do you mean by co-ordination number? With a neat figure, write co-ordinations number for HCP structures. (04 Marks)
- b. What is Crystal Imperfections? With a neat sketches, explain line defects and surface defects. (12 Marks)
- c. Explain briefly, Factors affecting diffusion. (04 Marks)
- 2 a. Differentiate between i) Engg. Stress of True stress ii) Engg. Strain and True strain. Derive the relation between Engg. Strain and True Strain. (08 Marks)
- b. Explain with neat sketches, plastic deformation by i) Slip and ii) Twinning. (08 Marks)
- c. Draw the stress – strain curve for a ductile material and explain the important points on the curve. (04 Marks)
- 3 a. What do you mean by Type – I, Type – II, and Type – III fractures? Explain with neat sketches. (06 Marks)
- b. What is Creep? Explain creep curve, with neat sketch. (08 Marks)
- c. Explain with neat sketches, Typical fatigue stress cycles (Fatigue Loading). (06 Marks)
- 4 a. Explain with neat sketch, the mechanism of solidification. (05 Marks)
- b. What is Homogeneous Nucleation? With a neat sketch, derive the relation for free energy charge, Δf_e . (10 Marks)
- c. Explain Hume – Rothary Rules for formation of solid solutions. (05 Marks)

PART - B

- 5 a. Explain briefly the construction of phase diagram using cooling curve, with a neat sketch. (05 Marks)
- b. Name the different types of phase diagrams. Explain with a neat sketch solid solution phase diagram (Complete solubility). (10 Marks)
- c. Draw the Iron - Carbon Equilibrium diagram and label all the phases. (05 Marks)
- 6 a. What do you mean by T - T - T curves? Explain with neat sketches, the construction of TTT curves for plain carbon steel. (10 Marks)
- b. Explain with neat sketch, Pack carburizing. (05 Marks)
- c. Explain with neat sketch, Flame Hardening. (05 Marks)
- 7 a. Explain the Composition, Properties and Applications of i) Gray cast iron ii) Malleable cast iron. (10 Marks)
- b. Explain the Composition, Properties and Application of i) Aluminum - Copper Alloys ii) Aluminum - Zinc Alloys. (10 Marks)
- 8 a. Define the Composite material. Explain the different types of Matrix Materials and Types of Reinforcements. (10 Marks)
- b. Explain with a neat sketch, the 'Pultrusion' process for producing FRP's. (06 Marks)
- c. Give the Advantages and Applications of composites. (04 Marks)
