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Third Semester B.E. Degree Examination, June/July 2016

Material Science and Metallurgy

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Missing data may be assumed suitably, if any.**

PART – A

- 1 a. Define APF. With a neat sketch obtain an expression for density packing factor of HCP structure. (08 Marks)
- b. Give brief classification of crystal defects. Explain them briefly. (06 Marks)
- c. List the factors affecting diffusion. Explain them briefly. (06 Marks)
- 2 a. Define engineering stress and strain and true stress and true strain. Establish the relationship between true strain and engineering strain. (07 Marks)
- b. List and explain the mechanical properties in elastic and plastic region. (07 Marks)
- c. Define CRSS? Obtain the expression for the same. (06 Marks)
- 3 a. Explain: i) Cup and cone fracture ii) Ductile to Brittle transition. (08 Marks)
- b. What are the different fatigue protection methods? Explain briefly. (06 Marks)
- c. What is stress relaxation? Derive an expression for the same. (06 Marks)
- 4 a. What is solid solution? With neat sketches explain different types of solid solution. (06 Marks)
- b. Explain Hume-Rothery rules and Gibbs phase rule. (06 Marks)
- c. Differentiate Homogeneous and Heterogeneous nucleation. How do you compute the critical size of nucleus and activation energy for the homogeneous nucleation? (08 Marks)

PART – B

- 5 a. A binary alloy of composition 60%A and 40%B consists two phases namely liquid and solid at a particular temperature. The composition of solid phase is 23%B and that of liquid phase is 68% B. Estimate the amount of solid and liquid phases in the alloy. (08 Marks)
- b. Draw Fe-Fe₃C diagram and show all phases, fields, temperature and composition. Write all invariant reactions. Also explain the solidification of steel containing 0.4%C. (12 Marks)
- 6 a. Explain TTT diagram (for 0.8%C steel) by super imposing the cooling curves on it. (12 Marks)
- b. Differentiate between :
 - i) Austempering and martempering
 - ii) Annealing and Normalising
 (08 Marks)
- 7 a. Give composition, micro structure, properties and applications of different types of cast – Irons. (12 Marks)
- b. Write a note on Magnesium alloys and Titanium alloys. (08 Marks)
- 8 a. Define composite. Give brief classification of composites. (06 Marks)
- b. With neat sketch explain production of composites, by pultrusion process. (08 Marks)
- c. Enumerate the merits, demerits and application of composites. (06 Marks)
