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10ME32A/AU32A

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018

Material Science and Metallurgy

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1 a. Define Atomic Packing factor. Derive an expression for atomic packing factor for HCP. (06 Marks)
- b. What is Diffusion? Explain. Give the laws governing diffusion with conditions. (08 Marks)
- c. Compare twin and tilt boundary defects in metals. Explain how they are useful in manufacturing process. (06 Marks)
- 2 a. Define i) Resilience ii) Tensile strength iii) Hardness iv) Ductility. (08 Marks)
- b. A specimen of 5mm diameter and 25mm gauge length is subjected to tensile test. If its diameter is reduced to 4mm through plastic deformation, what is its length? Also calculate engineering stress, engineering strain, true stress and true strain at the end of the deformation where the load is 500N. (08 Marks)
- c. Explain Brinell Hardness Testing. (04 Marks)
- 3 a. Draw the typical creep curve and explain different stages of creep. (08 Marks)
- b. What is fatigue? Explain with S-N curves for the fatigue life of ferrous and non – ferrous materials. (08 Marks)
- c. Differentiate between ductile and brittle fracture. (04 Marks)
- 4 a. Define Solid solution and explain different types of solid solution with figures. (08 Marks)
- b. What are Hume – Rothery's rules? (05 Marks)
- c. Explain the construction of phase diagram. (07 Marks)

PART – B

- 5 a. Draw the Fe – C diagram and label the phases. Show the invariant points on it. Write the reactions occurring at these points indicating the temperature and composition of the reactions. (12 Marks)
- b. Draw the TTT diagram for eutectoid steel and explain the effect of cooling rate in forming different microstructure. (08 Marks)
- 6 a. What is Harden ability? Explain the Joniney End Quench test to find the hardenability. (08 Marks)
- b. Explain the following Heat treatments :
i) Annealing ii) Hardening iii) Case Hardening iv) Flame Hardening. (12 Marks)
- 7 a. Explain different types of Cast Iron with Microstructure. (10 Marks)
- b. Explain composition and properties and applications of :
i) Gun metal ii) Al - Silicon alloy iii) Phosphor bronze iv) Al - Zinc alloy. (10 Marks)
- 8 a. Explain the classification of Composites. (04 Marks)
- b. Explain with neat sketches any two types of PMC manufacturing. (08 Marks)
- c. Write a note on advantages and disadvantages of composites materials and its applications. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8=50, will be treated as malpractice.