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10ME/AU42A

Fourth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Material Science and Metallurgy

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1
 - a. Define atomic packing factor and calculate atomic radius and packing factor for FCC structure. (08 Marks)
 - b. With neat sketches, explain the different types of point imperfections. (08 Marks)
 - c. State and explain the second Fick's law of diffusion. (04 Marks)

- 2
 - a. Draw the stress-strain curve for mild steel under tension and show the elastic region, plastic region. (05 Marks)
 - b. Define the following:
 - i) Stiffness
 - ii) Elastic strength
 - iii) Resilience
 - iv) Modulus of resilience
 - v) Toughness. (10 Marks)
 - c. Differentiate between slip and twinning. (05 Marks)

- 3
 - a. With neat sketches, explain the stages of moderately ductile fracture under the action of load. (08 Marks)
 - b. What is meant by stress relaxation? Explain in briefly. (05 Marks)
 - c. Explain the various factors affecting fatigue. (07 Marks)

- 4
 - a. Define solid solutions. Explain the types of solid solutions with neat sketches. (10 Marks)
 - b. Explain the factors governing the formation of substitutional solid solutions. (05 Marks)
 - c. State the Gibb's phase rule and explain the terms. (05 Marks)

PART – B

- 5
 - a. Draw and explain the Iron-Iron carbide equilibrium diagram and label all the points and fields. (10 Marks)
 - b. Two metals A and B have their melting points at 600°C and 400°C respectively. These metals do not form any compound or inter mediate phase. The maximum solubility in each other is 4%, which remains the same until 0°C, an eutectic reaction takes place between 65% A and 35% B at 300°C.
Determine the following:
 - i) Draw the phase diagram of A – B and label all the important points and fields.
 - ii) Find the temperature at which a 20% A, 80% B alloy starts and completes solidification.
 - iii) Find the temperature at which the same alloy is composed of 50% liquid and 50% solid. (10 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.

- 6 a. Draw the T-T-T diagram for 0.8% C eutectoid steel and explain briefly. (10 Marks)
b. Define hardenability. Explain with a neat sketch the Foming-end-quench test. (05 Marks)
c. Explain with neat sketch the flame hardening process. (05 Marks)
- 7 a. Write the composition, structure and their applications of
i) White cast iron.
ii) Malleable iron.
iii) S.G. iron. (10 Marks)
b. Write the composition and properties of the following:
i) Yellow α - brasses
ii) Alpha brasses
iii) Admiralty brass. (10 Marks)
- 8 a. Define composite material and explain the classification of composite materials. (10 Marks)
b. What are the advantages and limitation of composite material? (06 Marks)
c. Write a brief note on FRP. (04 Marks)

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