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Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019

Material Science and Metallurgy

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Define atomic packing factor. Find the atomic packing factor of BCC and FCC structures. (07 Marks)
- b. Explain with sketches line and surface defects. (08 Marks)
- c. State Fick's laws of diffusion. Explain briefly, factors affecting diffusion. (05 Marks)
- 2 a. Differentiate between ductile and brittle materials. (06 Marks)
- b. Explain with sketches:
 - i) Offset yield strength
 - ii) Ultimate tensile strength
 - iii) Toughness
 (06 Marks)
- c. Derive the expression for critical resolved shear stress for slip. (08 Marks)
- 3 a. Explain cup and cone fracture with neat sketch. (08 Marks)
- b. Explain creep curve showing different stages. (06 Marks)
- c. Define fatigue sketch the different types of fatigue loading. (06 Marks)
- 4 a. Explain with neat sketch mechanism of solidification. (06 Marks)
- b. What is homogeneous nucleation? Derive the expression for total free energy change with a neat sketch. (08 Marks)
- c. Define solid solution. Explain with sketch interstitial and substitutional solid solution. (06 Marks)

PART – B

- 5 a. Explain briefly the construction of phase diagram using cooling curve with sketches. (10 Marks)
- b. Draw Iron carbon diagram label all phases. Give the three invariant reactions. (10 Marks)
- 6 a. Draw TTT diagram for Hypo-Eutectoid steel containing 0.5% carbon. Show different phases. (11 Marks)
- b. Explain with sketch: (i) Normalizing (ii) Martempering (iii) Austempering. (09 Marks)
- 7 a. Compare Grey cast iron, spheroidal graphite iron with respect to composition, microstructure and properties. (08 Marks)
- b. Explain in detail about: (i) Brasses (ii) Al-Si alloys (iii) Al- Cu alloy. (12 Marks)
- 8 a. Define composite materials. Explain the different composite material with examples. (08 Marks)
- b. Explain with sketch, pultrusion process. (06 Marks)
- c. Give the advantages and application of composite materials. (06 Marks)

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