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10ME/AU32A

Third Semester B.E. Degree Examination, June/July 2017
Material Science & Metallurgy

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Draw the unit cell of BCC and FCC and find the coordination number and atomic packing factor for both. **(08 Marks)**

b. With neat figures, explain the line defects in crystal imperfections. **(08 Marks)**

c. State and explain the Fick's first law of diffusion. **(04 Marks)**

2 a. Explain the meaning of resilience, modulus of resilience, ductility and toughness. **(08 Marks)**

b. Explain the mechanism of plastic deformation of single crystal by slip and twinning, with the help of neat sketches. **(08 Marks)**

c. Draw stress-strain diagrams showing ductile and brittle behavior of materials. **(04 Marks)**

3 a. Briefly explain the creep properties and stress relaxation. **(08 Marks)**

b. With neat sketches, explain the stages of fatigue failure. **(08 Marks)**

c. What is fracture? How are they classified? **(04 Marks)**

4 a. Explain briefly the process of homogeneous and heterogeneous nucleation. **(08 Marks)**

b. Explain the differences between substitutional and interstitial solid solutions. **(08 Marks)**

c. Write briefly about Gibb's phase rule and modified phase rule. **(04 Marks)**

PART – B

5 a. With neat sketches, explain the construction of phase diagram. **(08 Marks)**

b. Draw a neat sketch of $F_e - F_{e3}C$ equilibrium diagram. Label all the fields and on that demarcate the regions where the following reactions take place: (i) Eutectic (ii) Peritectic and (iii) Eutectoid. **(08 Marks)**

c. State and discuss lever rule with an example. **(04 Marks)**

6 a. Superimpose continuous cooling curves on TTT diagram and describe the various transformed products of austenite on cooling. **(08 Marks)**

b. With sketches, explain Austempering and Martempering. **(06 Marks)**

c. With a neat sketch, explain the process of induction hardening. **(06 Marks)**

7 a. Write the typical composition, important properties and general application of low carbon steel and high carbon steel. **(08 Marks)**

b. Write briefly about Brasses and Bronzes. **(06 Marks)**

c. Write composition, properties and uses of Al-Cu and Al-Si alloys. **(06 Marks)**

8 a. With a neat sketch, explain the production of MMC by sand casting technique. **(08 Marks)**

b. What is composite material? Write the classifications of composite materials. **(06 Marks)**

c. What are the advantages and applications of composites? **(06 Marks)**

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