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10ME/AU42A

Fourth Semester B.E. Degree Examination, June/July 2017
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 coordination number. Also work-out the APF for FCC unit cell. **(08 Marks)**
b. Write note on crystal imperfections. **(04 Marks)**
c. Discuss diffusion process and laws of diffusion. **(08 Marks)**

2 a. Explain with stress-strain diagram the behavior of ductile metal under static tension till fracture. **(06 Marks)**
b. Discuss Johnson's offset method for finding yield stress. **(04 Marks)**
c. Distinguish between slip and twinning. **(04 Marks)**
d. A test bar of 6mm dia is subjected to tensile load of 600N and reduced to 5mm dia through plastic deformation. Calculate – i) Engg. Stress ii) Engg. Strain iii) True stress iv) True strain. **(06 Marks)**

3 a. Define fracture. Illustrate stages of ductile metal fracture in tensile loading. **(07 Marks)**
b. Explain creep curve with stages of creep. **(06 Marks)**
c. Illustrate fatigue testing arrangement. Also draw S-N curve for ferrous and non-ferrous materials. **(07 Marks)**

4 a. Discuss homogeneous and heterogeneous nucleation. **(05 Marks)**
b. Sketch and explain crystal growth and cast metal structure. **(05 Marks)**
c. List and briefly explain "Hume-Rothazy rules'. **(05 Marks)**
d. State Gibbs phase rule and explain each term. **(05 Marks)**

PART – B

5 a. With neat figure explain lever rule. **(06 Marks)**
b. Draw Iron – Carbon equilibrium diagram and discuss the salient features. **(10 Marks)**
c. Briefly write about invariant reactions. **(04 Marks)**

6 a. Briefly explain TTT curves with figure. **(05 Marks)**
b. List and explain various heat treatment processes. **(10 Marks)**
c. Define hardenability and how it is determined. **(05 Marks)**

7 a. Compare the properties and composition of grey cast iron and malleable iron. **(08 Marks)**
b. Briefly discuss SG iron and steel properties. **(06 Marks)**
c. Classify the various brasses with their use. **(06 Marks)**

8 a. Define composite materials and list the classification. **(06 Marks)**
b. Discuss the fundamentals of production of FRP's and MMC's. **(08 Marks)**
c. List the advantages and application of composites. **(06 Marks)**

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