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10ME/AU42A

Fourth Semester B.E. Degree Examination, June/July 2014
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. Explain crystal imperfections with a neat sketch. **(06 Marks)**

b. Define diffusion. What are the factors affecting diffusion? **(08 Marks)**

c. Copper has F.C.C. structure and an atomic radius of 1.278°A. Calculate its density. Given mol. wt = 63.54 g/mole. **(06 Marks)**

2 a. Define the following:
i) Toughness; ii) Yield stress; iii) Proportional limit; iv) Resilience. **(08 Marks)**

b. Derive an expression for critically resolved shear stress in a crystal structure. **(08 Marks)**

c. Calculate the resolved shear stress of a limit cell in a nickel if a tensile stress of 13.7 MPa is applied. Given that angle between the axial force and slip direction is 45° and angle between axial force and normal to slip plane is 54°. **(04 Marks)**

3 a. Derive an expression for homogeneous nucleation with a suitable graph. **(10 Marks)**

b. Explain the following with a suitable sketches:
i) Substitutional solid solution.
ii) Interstitial solid solution. **(10 Marks)**

4 a. What are the factors affecting the fatigue life? **(06 Marks)**

b. Write a short note on the following: i) Ductile fracture; ii) Brittle fracture. **(08 Marks)**

c. Draw a creep curve and explain its various stages. **(06 Marks)**

PART – B

5 a. Explain the classification of cast irons in detail. **(10 Marks)**

b. Why is iron carbide diagram drawn until 6.67% carbon? **(06 Marks)**

c. Define Martensite, Cemantite, Austenite and Ferrite. **(04 Marks)**

6 a. What are the objectives of heat treatment? **(06 Marks)**

b. Explain with a neat sketch of Jomony end quench test method. **(08 Marks)**

c. Explain inductive hardening with a neat sketch. **(06 Marks)**

7 a. What is merit by S.G. iron? Explain the structure composition and properties of S.G. iron. **(06 Marks)**

b. What are the factors affecting microstructure of cast iron? Explain. **(08 Marks)**

c. Explain the classification of engineering materials. **(06 Marks)**

8 a. Explain the classification of composite materials. **(08 Marks)**

b. What do you mean by ceramic matrix composites? **(06 Marks)**

c. List the advantages and disadvantages of composite materials. **(06 Marks)**

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