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10ME/AU32A

Third Semester B.E. Degree Examination, June/July 2019

**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. Sketch BCC , FCC , HCP structure and list their coordination number , APF values in percentage. (06 Marks)  
b. Define Atomic diffusion and explain how vacancy and interstitial diffusion occurs. (04 Marks)  
c. Sketch any two defects each from point and surface crystal imperfections. (05 Marks)  
d. Distinguish between Edge and Screw dislocation. (05 Marks)
- 2 a. Briefly explain the various mechanical properties in the plastic region. (06 Marks)  
b. A steel rod is subjected to tensile load of 7000 kg. The initial diameter is 13mm and when it is under the load is 12mm. Determine engineering stress and true stress. (04 Marks)  
c. Sketch the following mechanical behaviour of materials :  
i) Stress – strain curve for ductile and brittle material    ii) Cup and cone fracture  
iii) CRSS for single crystal. (04 Marks)  
d. Distinguish between slip and twinning. (06 Marks)
- 3 a. With reference to Fatigue and creep properties , briefly explain the significance of the following :  
i) S – N curve and Creep curve    ii) Factors affecting Fatigue and Creep. (12 Marks)  
b. How to improve the Fatigue life of materials? (05 Marks)  
c. What is meant by stress relaxation? (03 Marks)
- 4 a. Sketch and explain the three zones of cast metal structure. (06 Marks)  
b. What is the significance of gibbs phase rule? (04 Marks)  
c. Define Solidification and explain the mechanism of solidification. (07 Marks)  
d. Sketch Substitutional (ordered and disordered) and interstitial solid solution. (03 Marks)

**PART - B**

- 5 a. Sketch and label Iron – Carbon diagram and briefly explain the possible phases existing in it. (10 Marks)  
b. With the help of an example, explain lever rule. (04 Marks)  
c. Write the three invariant reactions. (03 Marks)  
d. Sketch cooling curve for pure metal and binary solid solution. (03 Marks)
- 6 a. Define Heat treatment and explain the purpose of conducting heat treatment also classify various heat treatment processes. (08 Marks)  
b. Define Hardenability. Explain Jominy end Quench test and its practical significance. (06 Marks)  
c. Explain briefly Age hardening of Aluminium copper alloy. (06 Marks)

- 7 a. Distinguish the features of steel and cast iron with respect to composition, types and their applications. (10 Marks)  
b. Classify various Brass and Bronze and list their industrial applications. (06 Marks)  
c. Write a note on Aluminium alloy. (04 Marks)
- 8 a. List the advantages and limitations of composite materials. (05 Marks)  
b. Distinguish between Thermoplastic and Thermo sets. (05 Marks)  
c. What are the difference between FRP and MMC? (05 Marks)  
d. List the steps involved in powder metallurgy technique used in manufacturing of composite materials. (05 Marks)

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