Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Define Space lattice and atomic packing factor, with an example. **(06 Marks)**
   b. The copper has a FCC structure and an atomic radius of 0.128nm and an atomic weight of 63.5 g/mol. Calculate the density of copper. **(06 Marks)**
   c. Enumerate the difference between Edge dislocation and screw dislocation. **(08 Marks)**

2 a. Explain the factors affecting atomic diffusion. **(10 Marks)**
   b. What do you mean by linear and non linear elastic properties of a material? Explain any three properties briefly. **(10 Marks)**

3 a. Derive an expression for the fracture strength of a real material based on Griffith's theory. **(06 Marks)**
   b. Describe briefly the Cold creep and Hot creep, with the curves. **(06 Marks)**
   c. What is Fatigue? Explain the factors affecting fatigue life. **(08 Marks)**

4 a. State Gibb's Phase rule and explain with a simple example. **(06 Marks)**
   b. Determine the degrees of freedom of a system of two components. When the number of phases is one, two , three etc. Consider temperature to be the only external variable. **(06 Marks)**
   c. Explain the heterogeneous nucleation with an example. **(08 Marks)**

PART - B

5 a. Draw Iron – Carbon equilibrium diagram and mark on it all salient temperatures, composition and phases involved. Elaborate the invariant reactions. **(10 Marks)**
   b. What are phase diagrams? Classify and explain the phase diagrams. Also mention the applications of phase diagrams. **(10 Marks)**

6 a. Explain Hypo – Eutectoid steel and Hyper – Eutectoid steel with the help of TTT diagrams. **(08 Marks)**
   b. Give the difference between TTT curve and CCT curve. **(06 Marks)**
   c. Explain the age hardening of Aluminium-Copper alloy , with an example. **(06 Marks)**

7 a. What are Light alloys? Explain any two light alloys with characteristics. **(08 Marks)**
   b. Differentiate between White Cast Iron and SG Iron with all characteristics. **(08 Marks)**
   c. Explain AISI 2515 and Fe E 300. **(04 Marks)**

8 a. Define Composite Materials and mention the classification of composites. **(04 Marks)**
   b. With a neat sketch, explain the production of metal – matrix composited. **(08 Marks)**
   c. Mention the advantages , limitations and applications of composite materials. **(08 Marks)**

*****

24 JAN 2020