



B.E. / B.Tech. (Full Time) ARREAR EXAMINATIONS, APRIL / MAY 2013

MATERIALS SCIENCE AND ENGINEERING BRANCH

THIRD SEMESTER – (REGULATIONS 2008)

ML 9204 – MATERIALS STRUCTURE AND PROPERTIES

4

Time : 3 hrs

Max Mark: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. What are the typical properties of metals that arise from the nature of their bonding?
2. Calculate the values of d_{200} and d_{111} in lead. Lead has a FCC structure and $a=4.95\text{\AA}$.
3. What types of strain fields surround the edge and the screw dislocations?
4. Calculate the relative amount of ferrite and Cementite in a steel containing 0.8%.
5. Distinguish between an intermediate phase and an intermediate compound.
6. Why are small amounts of lead added to some Cu-Zn brasses?
7. What are the characteristics of cemented carbide cutting tools?
8. Why whiskers are not used extensively as a reinforcing medium in composite materials?
9. What are the ways by which the strength of a polymer can be increased?
10. Why complete crystallinity is impossible in thermoplastics?

Part – B (5 x 16 = 80 Marks)

11. a. Explain the different types of Interatomic bonding that are found in solids.
 12. a. (i) Explain the different types of point defects. (6)
(ii) Calculate the concentration of vacancies in copper (FCC) at room temperature (25°C).
What temperature will be needed to heat treat copper such that the concentration of vacancies produced will be 1000 times more than the equilibrium concentration of vacancies at room temperature? Assume that 20000 cal. are required to produce a mole of vacancies in copper. $K=1.987\text{cal./mole-K}$, $a=3.6151\text{nm}$. (10)
- (OR)
12. b.(i) What are Solid Solutions and also explain the types of Solid solutions? (6)
(ii) Describe the factors that affect the formation of Substitutional solid solution. (10)

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13. i. Draw the Fe-Fe₃C phase diagram & label the phase fields. Discuss the various invariant reactions that take place in the system.

(OR)

13.b. Describe the effects of composition and heat treatment on the structure of cast irons and show how this affects the mechanical properties.

14. a. How are composites classified based on the matrix phase. Compare them based on their properties and applications.

(OR)

14. b. Write short notes on any four of the following: (4 x 4 = 16)

- (i). Intermetallic compounds
- (ii). Insulators
- (iii). Bearing alloys
- (iv). Semiconductors
- (v). Sensitisation

15. a. Draw the stress-Strain behavior of brittle, plastic and highly elastic polymeric materials. Explain.

(OR)

15. b. How are polymers classified? Explain the mechanisms of Polymerisation.
