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B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2011

MATERIALS SCIENCE AND ENGINEERING BRANCH

THIRD SEMESTER – (REGULATIONS 2008)

ML 9204 – MATERIALS STRUCTURE & PROPERTIES

Time : 3 hrs

Max Marks: 100

Answer ALL Questions

Part – A (10 x 2 = 20 Marks)

1. Enumerate the various types of bonds in crystals.
2. Show that a BCC structure is always more closely packed than a SC structure.
3. Differentiate between a solid solution and a compound.
4. Draw the following planes and directions in a FCC structure. (i) $(0\ 0\ 1)$ and (ii) $(1\ 2\ 0)$
5. Give the approximate composition of alloy steels which would be suitable for a rustless kitchen sink unit & an extrusion die for copper alloys.
6. Aluminium occupies second position after steel in the structural industry- Comment.
7. Why tempered bainite is inferior to tempered martensite with respect to mechanical properties?
8. What are the ways by which the strength of a polymer can be increased?
9. What are the characteristics of cemented carbide cutting tools?
10. Why is Tungsten so important as a constituent of a High Speed Steel?

Part – B (5 x 16 = 80 Marks)

11. a. (i) Describe the factors which affect the formation of Solid Solutions between two metals. (8)
 (ii) Show how these factors operate in the case of the metals Copper and Nickel and how the resulting properties of the alloys suit them for a particular application. (8)
 12. a. (i) What is crystal imperfection? (2)
 (ii) Describe the different types of Crystal imperfections in metallic materials. (14)
- (OR)
- b. (i) Draw the Iron-Iron Carbide equilibrium diagram and label all the phases. (12)
 (ii) Describe the equilibrium cooling of (a.) Fe-0.6%C, (b.) Fe-3.9%C, alloys from the molten stage and thus draw their microstructures at room temperature. (4)

13. a. Two metals A & B have melting points 750°C and 500°C respectively. They form an eutectic at 75% B which melts at 400°C . Their solubilities at eutectic temperature are, 20%B in A and 10%A in B and at 0°C , 5% B in A and 10% A in B.

From the above information, draw the equilibrium diagram for the system clearly making all the phases present. From the diagram, determine what structures would be obtained in slowly cooled alloys of the following compositions 10%B, 40%B, 75%B and 95%B.

(OR)

- 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)

- 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. Differentiate between the following:

- (i). Thermoplastics and Thermosets. (8)
- (ii). Addition polymerization and Condensation Polymerization (8)

(OR)

- b. (i). Draw the stress-Strain behavior of brittle, plastic and highly elastic polymeric materials. Explain.
