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B.E. / B.Tech. (Full Time) DEGREE ARREAR EXAMINATIONS, APRIL/ MAY 2012

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. Name the crystal structures (BCC, FCC or HCP) for the following metals : Magnesium and Aluminium.
2. Distinguish between Unit Cell and Space Lattice.
3. Copper has an FCC crystal structure and a unit cell with a lattice constant of 0.316 nm. What is its interplanar spacing  $d_{(220)}$ ?
4. Calculate the volume of the zinc crystal unit cell by using the following data. Zinc has HCP crystal structure with  $a=0.2665$  nm and  $c= 0.4947$  nm.
5. Provide two reasons why martensite is so hard and brittle?
6. Give the compositions of following: (i) Gun Metal (ii) Duralumin.
7. Calculate the modulus of elasticity for a laminated composite consisting of 63 vol. % of unidirectional carbon fibre & an epoxy matrix under isostress conditions. The modulus of elasticity of the carbon fibers is 230 GPa & that of the epoxy is  $4.80 \times 10^3$  MPa.
8. What are the general properties of polymeric materials?
9. Why thermoplastics are reshaped at elevated temperatures and not the thermosetting polymers?
10. Why is Tungsten so important, as a constituent of a High Speed Steel?

Part – B (5 x 16 = 80 Marks)

11. a. (i) Explain the Hume Rothery's laws for Substitutional Solid Solution. (10)
- (ii) Show how these laws operate in the case of the metals Copper and Nickel. (6)

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12. a. (i) Describe the different types of bonding in engineering materials.

(OR)

b. (i) Draw the Iron-Iron Carbide equilibrium diagram and label all the phases. (8)

(ii) Discuss in brief the different reactions that take place in the system. (8)

13. a. Write short notes on (i) Babbit materials (ii) Nuclear Metals (iii) Die Steels and (iv) Magnetic Alloys. (4x4=16)

(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. What are Super hard materials? Explain the characteristics of Tungsten Carbide & Boron Nitride.

15. a. Distinguish between Homopolymer and Copolymer. State the basic structural units of PMMA and nylon 6,6, elaborating their properties.

(OR)

b. What do you understand by the term polymerization? State the characteristics of long chain polymers. Describe briefly the deformation behaviour of plastics.

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