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B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2013

(Common to All Branches)

SECOND SEMESTER

(REGULATIONS: R 2008)

**PH 9164 – PHYSICS OF MATERIALS**

Time : 3 hr

Max. Mark:100

Answer ALL Questions

PART - A (10 x 2 = 20 Marks)

1. What are the advantages of the Gibbs Phase Rule?
2. Define supersaturation ratio and degree of supercooling.
3. What are the postulates of classical free electron theory?
4. A superconducting substance has a critical temperature of 2 K at zero magnetic field and a critical field of 0.02 Tesla at 0 K. Find the critical field at 1 K.
5. Differentiate between n-type and p-type semiconductors?
6. In an intrinsic semiconductor,  $n_i = 2.1 \times 10^{19} \text{ m}^{-3}$  and the mobilities of electron and holes are 0.4 and 0.2  $\text{m}^2/\text{V}\cdot\text{s}$ . Find its conductivity.
7. Define coercivity and retentivity of a magnetic material.
8. What is meant by dielectric loss?
9. Mention the properties of Ni-Ti alloy.
10. What is roentgen?

PART – B (5 x 16 = 80 Marks)

11. Describe the different methods of crystal growth. Discuss the techniques of growing single crystals from solution and from vapour. (4 + 12)
12. a) What are the postulates of the classical free electron theory? Derive an expression for the electrical conductivity of a metal on the basis of free electron theory. What are the factors affecting the conductivity of conductors? (4 + 8 + 4)  
OR  
b) Distinguish between type I and type II superconductors. What are the properties of superconductors? Give the applications of superconductors (6 + 4 + 6)
13. a) Obtain expressions for the density of majority charge carriers in n-type and p-type semiconductors. Describe the variation of Fermi level with temperature. (12 + 4)  
OR  
b) What is Hall effect? Derive an expression for Hall coefficient. Describe an experimental set-up for the measurement of the Hall coefficient. (4 + 6 + 6)
14. a) (i) What is ferromagnetism? Give the properties of ferromagnetic materials? (4 + 4)  
(ii) What is hysteresis? Explain the hysteresis loop on the basis of domain theory. (4 + 4)  
OR  
b) (i) Derive an expression for internal field and hence deduce Clausius-Mosotti equation. (8)  
(ii) Explain the different types of polarization mechanisms involved in a dielectric material. Write the Langevin-Debye equation (8)

15. a) Describe in detail the methods of production of metallic glasses, their types and applications.

OR

b) (i) Discuss the shape memory alloys and their applications.

(8)

(ii) Discuss in detail the principle and working of CT scan.

(8)