

B.E. / B.TECH DEGREE EXAMINATIONS, DECEMBER 2020

Second Semester

PH16252 – PHYSICS OF MATERIALS**(Regulation 2016)****Time: Three Hours****Maximum : 80 Marks**Answer **ALL** questions**PART A - (8 X 2 = 16 Marks)**

1. The Gibb's Phase rule for general system is
 - a. $P+F=C-1$
 - b. $P+F=C+1$
 - c. $P+F=C-2$
 - d. $P+F=C+2$
2. According to quantum theory the value of Lorentz number is
 - a. $1.22 \times 10^{-8} W\Omega K^{-2}$
 - b. $2.44 \times 10^8 W\Omega K^{-2}$
 - c. $2.44 \times 10^{-8} W\Omega K^{-2}$
 - d. $1.22 \times 10^8 W\Omega K^{-2}$
3. At $T = 0$ K when $E < E_F$, the Fermi distribution function $F(E)$ is equal to
 - a. 0
 - b. 1
 - c. $1/2$
 - d. infinity
4. When did the shape memory alloy could return to its original shape?
 - a. At transition temperature
 - b. At Curie temperature
 - c. At memory transfer temperature
 - d. At normal temperature
5. What do you infer from Fick's law of diffusion?
6. The superconducting transition temperature of lead is 7.26 K. The initial field at 0K is 64×10^3 amp/m. Calculate the critical field at 5K.
7. A sample of n-type current carrying semiconductor with a current density 50 A/m^2 , is subjected to a transverse magnetic field of 0.2 T. If the Hall field developed is $3 \times 10^{-4} \text{ V/m}$, Calculate the Hall Co-efficient of a semiconductor.
8. Calculate the electronic polarizability of Xenon. The radius of Xenon atom is 0.158 nm.

PART B - (4 X16 = 60 Marks)

9. (a) (i) How will you plot binary phase diagram for two metals which are completely soluble in liquid and solid states? (12)
- (ii) Sketch the different type of invariant reactions. (4)
- (OR)**
- (b) (i) How single crystal grown by melt growth technique? (10)
- (ii) How thin film can be prepared by Sol-Gel technique? (6)
10. (a) (i) Derive an expression for the density of energy states. (12)
- (ii) Discuss how it is used to calculate the Fermi energy of electrons at 0 K (4)
- (OR)**
- (b) Briefly explain the following:
- (i) Properties of superconducting materials. (8)
- (ii) High Temperature Superconductor (4)
- (iii) SQUID. (4)
11. (a) (i) Derive an expression for the concentration of electrons in the conduction band of an intrinsic semiconductor. (10)
- (ii) With necessary theory, describe the experiment method of determining the band gap of an intrinsic semiconductor. (6)
- (OR)**
- (b) (i) What is Hall effect? Derive an expression for Hall coefficient. Describe an experiment for the measurement of the Hall coefficient (12)
- (ii) A sample of silicon doped with 10^{23} phosphorous atom/m³. Find the Hall voltage in a sample with thickness = 100 μ m, current, $I_x = 1$ mA and magnetic field, $B_z = 0.1$ Wb/m². (Assume electron mobility, $\mu_e = 0.07$ m²/Vs) (4)
12. (a) (i) Explain electronic and ionic polarization mechanisms occurs in dielectric materials with a neat diagram. (10)
- (ii) Discuss in detail the various dielectric breakdown mechanisms. (6)
- (OR)**
- (b) (i) Discuss the working of position sensitive scintillation detectors and mention their uses. (8)
- (ii) Describe biomaterials with their types, properties and applications. (8)