

BE DEGREE EXAMINATIONS: OCTOBER / NOVEMBER-2008

Second Semester

U07PH201: PHYSICS –II**(Common to Electrical and Electronics Engineering & Electronics and Instrumentation Engineering)****Time: Three Hours****Maximum Marks: 100****Answer ALL Questions:-****PART A (20 x 1 =20 Marks)**

1. The Fermi –Dirac distribution function $F(E)$ is
 - a. $1/(1+e^{(E-E_f)/KT})$
 - b. $1/(1+e^{(E-E_f)/KT})$
 - c. $1/(1-e^{(E-E_f)/KT})$
 - d. $1/(e^{(E-E_f)/KT})$

2. When an electron in a periodic potential of lattice is accelerated by an electric field or magnetic field then the mass of the electron is called
 - a. Critical mass
 - b. Empirical mass
 - c. Effective mass of hole
 - d. Effective mass of electron

3. The first brillouin zone lies between
 - a. $-2\pi/a < k < -\pi/a$
 - b. $\pi/a < k < 2\pi/a$
 - c. $-\pi/a < k < \pi/a$
 - d. $-2\pi/a < k < 2\pi/a$

4. The mean free collision time of copper at 300K is equal to 2×10^{-14} sec. Given density of electron is $8.5 \times 10^{28} / \text{m}^3$. The value of electrical conductivity in $\text{ohm}^{-1} \text{m}^{-1}$ is
 - a. 4.8×10^7
 - b. 3.8×10^7
 - c. 48×10^7
 - d. 0.38×10^7

5. Type II super conductor has
 - a. One critical field
 - b. Two critical field
 - c. Three critical field
 - d. No critical field

6. The hall coefficient of certain silicon specimen was found to be $7.35 \times 10^{-5} \text{ m}^3/\text{c}$. Assuming only electrons as charge carriers, the value of electron density is
 - a. $7.5 \times 10^{22} / \text{m}^3$
 - b. $7 \times 10^{22} / \text{m}^3$
 - c. $8.5 \times 10^{22} / \text{m}^3$
 - d. $85.03 \times 10^{22} / \text{m}^3$

7. The intrinsic carrier density at room temperature in germanium is $2.37 \times 10^{19}/\text{m}^3$. If the electron and hole mobilities are 0.38 and $0.18 \text{ m}^2/\text{V S}$ respectively. The value of intrinsic conductivity is
- $2.12 \Omega^{-1}\text{m}^{-1}$
 - $1.12 \Omega^{-1}\text{m}^{-1}$
 - $1.12 \Omega \text{m}$
 - $21.2 \Omega \text{m}$
8. The critical temperature for a metal with isotopic mass 199.5 is 4.185 K. If the critical temperature falls to 4.133 K the value of isotopic mass is
- 194.5
 - 201.5
 - 214.54
 - 204.5
9. A Para magnetic material has a magnetic field intensity of 10^4 A/m . If the susceptibility of the material at room temperature is 3.7×10^{-3} the value of Intensity of magnetization is
- 37 A/m
 - $37 \times 10^7 \text{ A/m}$
 - $3.7 \times 10^{-7} \text{ A/m}$
 - $37 \times 10^{-7} \text{ A/m}$
10. The spin alignment is antiparallel and of different magnitudes occurs in
- Paramagnetic
 - Diamagnetic
 - Ferromagnetic
 - Ferrimagnetic
11. The value of one Bohr magneton is
- $e/\hbar m$
 - $2\pi m/eh$
 - $eh/2\pi m$
 - $eh/4\pi m$
12. An ideal soft magnetic material has
- Zero Hysteresis loss
 - Low Hysteresis loss
 - High Hysteresis loss
 - Very high Hysteresis loss
13. For a dielectric material, the dielectric power loss is given by
- $V^2 I \cos \theta$
 - $VI \cos \theta$
 - $(V/I) \cos \theta$
 - $VI \tan \theta$
14. For a given dielectric, the electronic polarisability
- Increases with temperature
 - Decreases with temperature
 - Is not affected by temperature
 - May increase or decrease with temperature

15. The bound electron hole pair in a semiconductor is called
- Traps
 - Exciton
 - Stark effect
 - Colour center
16. Which crystal shows Ferro electric property in all three phases namely rhombohedral, orthorhombic and tetragonal
- Rochelle salt
 - KDP
 - Barium titanate
 - Quartz
17. Materials that possess compatibility with human cells and tissues to act as implant materials are called as
- Biomaterials
 - Metallic glasses
 - Nano phase materials
 - Shape memory alloy
18. The concept of pulse propagation without change of shape and loss of energy for any long distance is referred to us
- Optical mixing
 - Optical phase conjugation
 - Dispersion
 - Solitons
19. The process in which there is a conversion to double the frequency of the fundamental radiation when sent through certain crystals like KDP is known as
- Second harmonic generation
 - Optical mixing
 - Optical phase conjugation
 - Parametric amplification
20. Non-linear media which are capable of reversing the incident optical beam to produce its phase conjugate beam are called
- Optical mixing
 - Self phase modulation
 - Phase conjugate mirror
 - Second harmonic generation

PART-B (5 x 16= 80 Marks)

21. (a). Derive an expression for the density of states and based on that obtain a general expression for the fermi energy of electron in solids at zero degree Kelvin. (16)
- (OR)**
21. b. (i) Derive an expression for the electrical conductivity of a metal. (8)
- (ii) Distinguish conductors, semiconductors and insulators on the basis of band theory of solids. (8)

22.a. Assuming Fermi-Dirac statistics derive an expression for density of electron and holes in an intrinsic semiconductor. Hence obtain an expression for carrier concentration in intrinsic semiconductor. (16)

(OR)

22.b. What is Hall effect? Derive an Expression for Hall Co-efficient. Describe an experimental set-up for the measurement of the Hall Co-efficient. (16)

23.a. Explain the different contributions for the formation of domains in a ferromagnetic material and show how the hysteresis curve is explained on the basis of the domain theory. (16)

(OR)

23.b. What are magnetic bubbles? How are they used for data storage? Explain in detail the magnetic bubble as the storage medium. (16)

24.a. What is meant by local field in di-electric and how it is calculated for a cubic structure? Deduce clausius mosotti equation. (16)

(OR)

24.b. Explain with neat sketch the theory and working of liquid crystal as display material. What are the different types? Mention its advantages. (16)

25.a. What are metallic glasses? How are they prepared? Explain their use as a transformer core material. (16)

(OR)

25.b. What are shape memory alloys? Discuss their properties and applications. (16)
