Register Number: ……………………..

B.E / B.TECH DEGREE EXAMINATIONS:MAY/JUNE 2014

(Regulation 2009)

Second Semester

PHY104: MATERIALS SCIENCE

(Common to CSE, EEE, EIE & IT)

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. If the mobility of electrons in a metal increases, the resistivity
   a) Increases
   b) Remains the same
   c) Decreases
   d) Equals to the conductivity

2. A normal conductor and a superconductor are classified on the basis of
   a) Availability of conducting electrons at low temperature
   b) Availability of conducting electrons in pairs at low temperature
   c) Nonzero resistance at low temperature
   d) Zero resistance at critical temperature

3. Band gap between the conduction band and valence band of a conductor is
   a) About 2 eV
   b) About 5 eV
   c) Zero
   d) eVAbout 11

4. The direction of Hall voltage is
   a) Parallel to applied electric field
   b) Parallel to applied magnetic field
   c) Perpendicular to electric field only
   d) Perpendicular to both applied electric and magnetic fields.

5. Ionic polarization
   a) Decreases with increase in temperature
   b) Is independent of temperature
   c) Increases with temperature
   d) First increases, then decreases with temperature

6. Diamagnetic substances when placed in a magnetic field are
   a) Strongly attracted
   b) Repelled
   c) Weakly attracted
   d) Neither attracted nor repelled

7. Carbon nano tubes are
   a) Nano particles
   b) Carbon only
   c) Rolled sheet of graphene
   d) Crystalline solids

8. Austenite and Martensite phases are obtained for
   a) Metallic glasses
   b) Dielectrics
   c) Shape memory alloys
   d) Carbon nanotubes

9. The Liquid Crystal Display works
   a) When the electric field is applied
   b) In the absence of electric field
   c) When the magnetic field is applied
   d) Independent of electric and magnetic fields

10. The trapping of electron in a negative ion vacancy in NaCl is known as
    a) C - centre
    b) V – centre
    c) F- centre
    d) M - centre

PART B (10 x 2 = 20 Marks)

11. What are density of energy states?

12. Explain isotopic effect of superconductor.

13. Explain elemental and compound semiconductors with examples.

14. The Hall coefficient of a specimen is 3.66×10^{-4} m^3/ C. Give the type and density of charge carriers.

15. What are soft and hard magnetic materials?

16. What is meant by dielectric loss?

17. What are carbon nano tubes?

18. Give the different structures of carbon nano tubes?

19. What are Excitons?

20. Give the advantages of IC packaging materials.

PART C (5 x 14 = 70 Marks)

21. a) (i) Explain the postulates of classical free electron theory and also derive the expression for electrical conductivity of a conducting material. (10)
    (ii) Explain the drawbacks of classical free electron theory. (4)

    (OR)

    b) (i) Discuss in detail the different properties of superconductors. (10)
    (ii) Explain high T_c superconductors with examples. (4)

22. a) (i) Derive an expression for density of electrons in the conduction band of an intrinsic semiconductor. (10)

(ii) Find the intrinsic resistivity of Germanium if the carrier density is 2.15×10^{13} / (4) cm^2 and the mobilities of electron and hole are 3900 and 1900 cm^2/V.s respectively.

(OR)

b) (i) What is Hall effect and derive Hall coefficient for n-type and p-type (10) semiconductors and derive Hall voltage in terms of Hall coefficient.

(ii) Calculate the Hall coefficient of a specimen whose electrical conductivity is 2.12 (4) mho/m and charge carrier mobility is 0.36 m^2/Vs.

23. a) Discuss in detail the Langevin's theory of paramagnetism and derive necessary formula for the same.

(OR)

b) (i) What is dielectric breakdown and explain different types of breakdown (10) mechanism.

(ii) Explain the storage of magnetic data in floppy discs. (4)

24. a) (i) Discuss in detail the theory, properties and applications of metallic glasses. (10)

(ii) Explain the applications of shape memory alloys. (4)

(OR)

b) (i) Explain preparation of nano particles by chemical vapour deposition and also (7) give its advantages.

(ii) Explain the preparation of carbon nano tubes by pulsed laser technique. (7)

25. a) (i) Explain the different types of colour centres. (7)

(ii) Explain fluorescence and phosphorescence and their differences. (7)

(OR)

b) (i) Explain the working of twisted nematic crystal display and also its advantages (10) and disadvantages.

(ii) Explain the theory of second harmonic generation. (4)

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