Register Number: ………………………

B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2010
Second Semester
PHY104: MATERIALS SCIENCE
(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Computer Science and Engineering, Information Technology)

Time: Three Hours   **Maximum Marks: 100**
Answer ALL Questions:-
PART A (10 x 1 = 10 Marks)

1. If the mobility of electron increases the conductivity
   A) increases   B) decreases   C) increases with the increase of temperature   D) remains constant
2. Magnitude of critical current density in a superconductor depends upon
   A) Peltier effect   B) magnetic field strength   C) Meissner effect   D) Silsbee effect
3. Intrinsic concentration of charge carriers in a semiconductor varies
   A) $T^{2/3}$ B) $T^{2/5}$ C) $T^{3/2}$ D) $T^{3/5}$
4. The Hall Effect produces
   A) force   B) a transverse e.m.f   C) pressure   D) a longitudinal e.m.f.
5. In a ferromagnetic material, the susceptibility is
   A) small and negative   B) small and positive
   C) very large and negative   D) very large and positive
6. Dielectric materials are mainly used for
   A) electrostriction   B) magnetostriction   C) charge storage   D) insulation
7. Shape memory alloys are also called as
   A) semiconductors   B) superconductors   C) active materials   D) conductors
8. The structural applications of nano phase materials are based on
   A) Electrical properties   B) Mechanical properties
   C) Superconducting properties   D) Magnetic properties
9. Every exciton produces a
   A) loss of two charges   B) loss of electron   C) gain of two charges   D) loss of hole
10. The following material is used as IC packaging material for the preparation of substrates
    A) lead frames   B) bronze frames   C) silver frames   D)steel frames

PART B (10 x 2 = 20 Marks)

11. Define Fermi energy.
12. The critical temperature of tin material is 3.7 K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2 K.
13. What are donors and acceptors?
14. Mention any two applications of Hall Effect.
15. Write down any two properties of anti ferro magnetic materials.
16. What are the various sources by which power loss occurs in a dielectric?
17. List any two applications of shape memory alloys.
18. What is fullerene?
19. Distinguish between fluorescence and phosphorescence.
20. What are traps?

PART C (5 x 14 = 70 Marks)

21. (a) (i) Obtain an expression for electrical conductivity of metals.   (10)
        (ii) Write a note on Fermi distribution function.   (4)
(OR)
    (b) (i) Discuss the various applications of superconductors.   (10)
        (ii) Distinguish between Type-I and Type-II superconductors.   (4)

22. (a) (i) Obtain an expression for intrinsic carrier concentration. (10)
    (ii) The intrinsic carrier density at room temperature in Germanium is $2.37 \times 10^{19}/m^3$. If the electron and hole mobility are 0.38 and 0.18 m^2/Vs respectively calculate the resistivity. (4)

(OR)

   (b) (i) Show that for a n-type semiconductor the Hall coefficient R_H is 1/ne. (10)
    (ii) The Hall coefficient of n-type semiconductor is 4.16×10^{-4} m^3 C^{-1} and conductivity is 108 mho/m. Calculate its charge carrier density. (4)

23. (a) (i) Draw the B-H curve of a ferro magnetic material. Describe it on the basis of domain theory. (10)
    (ii) Differentiate between hard and soft magnetic materials. (4)

(OR)

   (b) (i) Discuss elaborately any two breakdown mechanisms with its characteristics. (10)
    (ii) Write a note on the frequency effect of polarization. (4)

24. (a) What are metallic glasses? How are they prepared? Discuss its various applications.

(OR)

   (b) (i) Describe the synthesis of nano materials by chemical vapor deposition method. (10)
    (ii) List any four applications of carbon nano tubes. (4)

25. (a) Give an account on the non linear optical materials and their applications.

(OR)

   (b) (i) Describe the construction and working of twisted nematic crystal display. (10)
    (ii) Mention the applications of liquid crystal display. (4)

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