Register Number: ……

B.E DEGREE EXAMINATIONS: JUNE 2010

Second Semester

PHY104: MATERIALS SCIENCE

(Common to B.E – Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Computer Science and Engineering, B.Tech-Information Technology)

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

Answer ALL Questions:-

PART A (10x1=10Marks)

1. Fermi distribution function F (E) is equal to

a) $1(1+e^{\frac{(E-E_F)}{KT}})$ b) $\frac{1}{1+e^{\frac{(E-E_F)}{KT}}}$ c) $\frac{1}{e^{\frac{(E-E_F)}{KT}}}$ d) $\frac{1}{1-e^{\frac{(E_F-E)}{KT}}}$

2. Type -II Super conductors have

a) one critical magnetic field. b) two critical magnetic field.

c) three critical magnetic field. d) no critical magnetic field.

3. The negative mass behaviour of electrons is called as

a) Semiconductors. b) Cooper pairs. c) holes d) Insulators

4. The effective density of states in the conduction band

a) is an absolute constant. b) is a constant with respect to temperature.

c) increases with increasing temperature. d) reduces with increasing temperature.

5. Ferro electric is

a) one which conducts only in the presence of electric field.

b) magnetic material which is also good conductor of electricity.

c) the Non-conductor whose polarization is caused by an electric field

d) the Non-conductor exhibit electric polarization even in the absence of the electric field.

6. Which of the following materials do not have permanent magnetic dipoles?

a) Paramagnetic b) Diamagnetic c) Ferromagnetic d) Ferrimagnetic

7. The two states of Shape memory alloys are

a) Martensite and Austenite phase b)Martensite and marbonite phase

c) Austenite and marbonite phase d)Austenite and carbonite phase

8. A Single sheet of graphite is called as

a) graphene b)carbon c)metallic glass d) NiTinol

9. Phosphorescence refers to

a) optical absorption b) exciton c) emission of light d) delayed fluorescence

10. Solitons are referred as pulse propagation

a) without change of shape and loss of energy

b) with change of shape and loss of energy

c) with change of shape and increase of energy

d) without change of shape and decrease of energy

PART B (10 x 2 = 20 Marks)

11. What are the drawbacks of classical free electron theory?

12. A superconducting Tin has a critical temperature of 3.7K in zero magnetic fields and a critical field of 0.0306 Tesla at 0K. Find the critical field at 2K.

13. Sketch the position of fermi level in intrinsic and extrinsic semiconductor at 0K.

14. The Hall co-efficient of certain silicon specimen was found to be 7.35×10^{-5} m^3C^{-1}. Calculate its charge carrier density.

15. What is Dielectric loss?

16. What is magnetic bubble memory?

17. List out any four applications of Shape Memory Alloy.

18. Name any four methods employed to produce nanophase materials.

19. What are excitons?

20. Explain the optical phase conjugation.

PART C (5 x 14 = 70 Marks)

21. (a) (i) Derive an expression for electrical conductivity of a metal. (7)

(ii) Derive an expression for the density of energy states in metals. (7)

(OR)

(b) (i) Explain superconducting phenomena and differentiate Type-I and Type- II Superconductors. (7)

(ii) Explain in detail any two applications of Superconductor. (7)

22. (a) (i) Derive an expression for density of holes in the valence band of an intrinsic semiconductor. (7)

(ii) Explain the concept of effective mass of an electron and hole. (7)

(OR)

(b) (i) What is Hall effect? Describe an expression to determine Hall coefficient. (7)

(ii) Distinguish between a P-type and N-type semiconductor. (7)

23. (a) (i) Explain the Hysteresis curve on the basis of domain theory. (7)

(ii) Explain the structure of ferrites and its preparation. (7)

(OR)

(b) (i) Explain the frequency and temperature dependence of polarization. (7)

(ii) What is dielectric break down? Discuss in detail the various dielectric breakdown mechanism. (7)

24. (a) (i) What are metallic glass? How are they prepared? (7)

(ii) What is shape Memory effect? Discuss their characteristics. (7)

(OR)

(b) (i) Describe the chemical vapour deposition method to produce nano materials. (7)

(ii) What is carbon nanotube? Discuss its structure. (7)

25. (a) (i) Write a note on optical mixing and solitons. (7)

(ii) With neat sketch explain the twisted nematic Liquid crystal display. (7)

(OR)

(b) (i) Describe the phenomena of phosphorescence and fluorescence. (7)

(ii) Briefly explain the various colour centres present in the crystal. (7)

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