KUMARAGURU
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Register Number: …...……….

B.E / B.TECH DEGREE EXAMINATIONS: DEC 2014

(Regulation 2013)

Second Semester

U13PHT203: MATERIALS SCIENCE

(Common to CSE/ECE/EIE&IT)

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The average velocity acquired by the free electron in a particular direction during the presence of an electric field is called as

   a) drift velocity   b) Fermi velocity

   c) mean free velocity   d) elastic velocity

2. Super conductors are perfect …………..magnetic material.

3. At 0K a semiconductor acts

   a) as a superconductor   b) as a good conductor

   c) as an insulator   d) same as semiconductor

4. In an intrinsic semiconductor, the Fermi level lies almost midway in the ……………..

5. For a good dielectric, conduction current is

   a) equal to displacement current   b) less than displacement current

   c) greater than displacement current   d) not related with displacement current

6. The materials which are magnetized easily are known as ……….. materials.

7. Metallic glasses are

   a) glasses with metallic impurities   b) high strength glasses

   c) rapidly quenched metals   d) metals which are in clay form

8. ………….. method is used to produce a range of nanoparticles with controlled chemical composition.

9. If a substance absorbs light and radiates within 10^{-7} seconds, the process is said to be

   a) phosphorescence   b) fluorescence

   c) resonance   d) luminescence

10. In the absence of external field, the LCD is purely ……………..

PART B (10 x 2 = 20 Marks)
(Not more than 40 words)

11. Superconducting material Tin has a critical temperature of 3.7K at zero magnetic fields and the critical field of 0.0305 Tesla at 0 K. Find the critical field at 2K.

12. State Wiedemann-Franz law.

13. Extrinsic semiconductors are mostly preferred than intrinsic semiconductors. Why?

14. List four important applications of Hall effect.

15. Mention the reasons for dielectric loss in dielectric materials.

16. Mostly ferrites are used as magnetic storage medium. Why?

17. List the characteristics of shape memory alloys (SMA).

18. Give the different structures of carbon nano tubes.

19. Distinguish between LED and LCD.

20. Write the importance of optical phase conjugation.

PART C (5 x 14 = 70 Marks)
(Not more than 400 words)

21.   Explain the principle and working of liquid crystal display devices. Give its advantages and disadvantages.

22. a) (i) Obtain an expression for density of states in a metal and hence deduce the equation for Fermi energy in terms of density of free electrons. (10)

   (ii) The density and atomic weight of Cu are 8900 Kg m^{-3} and 63.50. The relaxation time of electrons in Cu at 300 K is 10^{-14} s. Calculate the electrical conductivity of Copper. (4)

(OR)

   b) (i) Compare type I and type II superconductors. (10)

   (ii) Write short note on "Magnetic Levitation Trains". (4)

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

   (ii) Explain variation of carrier concentration with temperature in semiconductors. (4)

(OR)

b) (i) Obtain an expression for Hall voltage to n-type semiconductor. (10)

(ii) A current of 50 A is established in a slab of copper, 0.5 cm thick and 2 cm wide. The slab is placed in a perpendicular magnetic field B of 1.5 Tesla. The free electron concentration in Cu is 8.4×10^{28} m^{-3}. What will be the magnitude of the Hall voltage across the width of the slab? (4)

24. a) (i) Explain electronic and ionic polarization mechanism in dielectric materials. (10)

(ii) Illustrate graphically how polarization varies with applied frequency in dielectrics. (4)

(OR)

b) (i) Explain Domain theory of ferromagnetic substance and discuss four types of energy involved in domain growth. (10)

(ii) Write short note on how optical data can be stored effectively by using Bubble memory. (4)

25. a) (i) With neat sketch, explain in detail how metallic glasses are manufactured. (10)

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

(OR)

b) (i) Describe with neat sketch how nanoparticles are prepared employing the top-down method of ball milling process. (10)

(ii) Write any four industrial applications of carbon nano tubes. (4)

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