KUMARAGURU
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character is life

Register Number: ………………..

B.E/B.TECH DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2009)

Second Semester

PHY104: MATERIALS SCIENCE

(Common to CSE/IT)

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The value of F(E) for $E-E_F = 0.01$ eV at 200 K is

   A. 0.3589   B. 0.3589   C. 0.3589   D. 0.3589

2. If the Superconducting tin has a critical temperature of 3.7 K at zero magnetic   field and a critical field of 0.0306 Teslas at 0K then the critical field at 2K is

   A. 0.00002166 teslas   B. 00.002166 teslas

   C. 0.002166 teslas   D. 0.02166 teslas

3. The Fermi energy level in an intrinsic semiconductor is equal to

   A. $E_F = (E_A+E_C)/2$ B. $E_F = (E_D+E_C)/2$

   C. $E_F = (E_C+E_V)/2$ D. $E_F = (E_C-E_V)/2$

4. N-type silicon is obtained by doping Si with

   A. Boron   B. Aluminum   C. antimony   D. indium

5. The susceptibility of dia magnetic materials

   A. varies directly with temperature (T)   B. varies with (1/T)

   C. varies with $(1 / T^2)$ D. independent of temperature

6. The unit of polarization is

   A. Coulomb.mete   B. Coulomb /meter

   C. Coulomb / m^2 D. Coulomb / m^3

7. Melt spinning technique is used to prepare

   A. shape memory alloys   B. Nanoparticles

   C. metallic glasses   D. high sensitivity sensors

8. The size of the nanomaterials is the order of

   A. 1 – 10 nm   B. 1 – 100 nm   C. 0.1- 1 nm   D. 0.01 – 1 nm

9. Among the following which will produce higher life time for free charge carriers?

   A. color centres   B. recombination centres   C. traps   D. excitons

10. Solitons are

   A. waves   B. particles   C. Cast Iron   D. Silicon carbide

PART B (10 x 2 = 20 Marks)

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

12. Define Meissner effect.

13. List the properties of semiconductors.

14. Define Hall-effect.

15. Define coercivity.

16. What are the applications of ferrites?

17. What are Metallic Glasses?

18. What is non-linear optical material?

19. What are Colour centres?

20. What is meant by optical mixing?

PART C (5 x14 = 70 Marks)

21. (a) (i) Develop an expression for electrical and thermal conductivity of metals.   (10)

    (ii) Demonstrate Widemann Franz law.   (4)

(OR)

  (b) (i) Distinguish between Type I and Type II superconductors. Also give examples. (10)

    (ii) What are high temperature superconductors?   (4)

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

    (ii) Explain the concept of effective mass of an electron and a hole.   (4)

(OR)

  (b).(i) Develop an expression for the Hall coefficient. Explain an experiment for the measurement of the Hall coefficient.   (10)

    (ii) Outline the applications of Hall effect.   (4)

23. (a).(i) Discuss the Weiss theory of ferromagnetism.   (10)

    (ii) Distinguish between soft and hard magnetic materials.   (4)

(OR)

(b).(i) Formulate an expression for electronic and ionic polarization. (10)

    (ii) What are the different types of breakdown mechanisms in dielectrics? (4)

24. (a).(i) Explain the characteristics and applications of Shape Memory Alloys. (10)

    (ii) What are the applications of metallic glasses? (4)

(OR)

(b).(i) Discuss the Chemical vapor deposition method for the fabrication of Carbon nanotubes. (10)

    (ii) What are the structures of carbon nanotubes? (4)

25 (a).(i) Explain the construction and working of liquid crystal display. (10)

    (ii) Explain fluorescence. (4)

(OR)

(b).(i) Describe the different types of IC packing materials. (10)

    (i) What are solitons? (4)

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