KUMARAGURU
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Register Number:………………

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

(Regulation 2013)

Second Semester

U13PHT203: MATERIALS SCIENCE

(Common to CSE/EIE/ECE/IT)

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Electrical conductivity (microscopic form of ohm's law)

   a) J/E   b) E/J

   c) JE   d) RA/L

2. _____effect cannot be explained by the classical free electron theory.

3. In an intrinsic semiconductor, the Fermi level lies

   a) just below the conduction band   b) just above the valance band

   c) half way between conduction band and   d) within the conduction band
       valance band

4. At 0K a semiconductor acts as _____.

5. Materials which lack permanent magnetic dipoles are called

   a) ferromagnet   b) ferrimagnet

   c) paramagnet   d) diamagnet

6. Creation of electric polarization by mechanical stress is known as _____.

7. The approach used to construct nanomaterials by merging smaller components into more complex assemblies is,

   a) top-down approach   b) bottom-up approach

   c) bottom-bottom approach   d) top-top approach

8. The material changes its shape at low temperature by deformation and regaining of original shape by warming it is called_____.

9. The crystal used in optical mixing frequency down conversion is

   a) potassium dihydrophosphates   b) ammonium dihydrophosphate

   c) barium titanate   d) lithium niobate

10. Materials exhibiting phosphorescence are known as _____.

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

11. Recall Wiedemann Franz law.

12. Show that the superconductors are diamagnet.

13. What are intrinsic semiconductors? Give an example.

14. The Hall coefficient of certain silicon specimen was found to be -7.35 x 10^{-5} m^3C^{-1} from 100K to 400K. Determine the nature of the semiconductor. Also calculate the density of the charge carrier.(charge of electron = 1.6 x 10^{-19} C)

15. Recollect the concept of domain in ferromagnetism.

16. List out any four properties of ferroelectric materials.

17. Give any two applications of Smart materials?

18. Mention the structures of carbon nano tube.

19. Mention one important feature of each exciton and hole.

20. What is non-linear optics?

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

Q.No. 21 is Compulsory

21.   Explain the theory and working of liquid crystal display. What are the different types? List out the advantages and disadvantages of LCD.

22. a) (i)   What is electrical conductivity? Derive an expression for electrical conductivity (10) of a metal on the basis of free electron theory.

    (ii) Evaluate the value of Fermi distribution function for an energy KT above the (4) Fermi energy at that temperature and give some comments on your answer.

(OR)

    b) (i)   What are superconductors? Explain the following applications of (10) superconductors: (i) SQUID (ii) MEGLEV

    (ii) Distinguish between type I and type II superconductors.   (4)

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

    (ii) Explain the variation of Fermi level with concentration in an n-type (4)

semiconductor with a neat diagram.

(OR)

b) (i) What is Hall effect? Show that for a p-type semiconductor the Hall coefficient (10) R_H is 1/pe. Describe an experimental setup to measure the Hall voltage.

(ii) A current of 50A is established in a slab of Cu 0.5cm thick and 2 cm wide. The (4) slab is placed in a magnetic field of 1.5T. The magnetic field is perpendicular to the plane of the slab and to the current. The free electron concentration in copper is 8.48 $x10^{28}$ electron /m^3. What will be the magnitude of Hall voltage across the width of the slab?

24. a) (i) Distinguish between hard and soft magnetic materials. (10)

(ii) Explain the working of bubble memories. (4)

(OR)

b) (i) What is dielectric breakdown? Summarize the various factors contributing to (10) breakdown in dielectrics.

(ii) Discuss the effect of temperature on various types of dielectric polarization (4)

25. a) What are metallic glasses? Mention the properties and explain how metallic glasses are prepared. Explain their use as transformer core materials.

(OR)

b) What are carbon nano tubes? Explain with a neat diagram how CNT are fabricated by pulsed laser deposition and chemical vapour deposition method.

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