Reg. No. : | | | | | | | | | | |

Question Paper Code: 50024

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Second Semester

Electrical and Electronics Engineering

15UPH204 – SOLID STATE PHYSICS

(Common to Biomedical Engineering)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Flow of electrons is affected by the following

   (a) Thermal vibrations (b) Impurity atoms
   (c) Crystal defects (d) All the above

2. Commonly used conducting materials are

   (a) Copper (b) Aluminium
   (c) Both (a) and (b) (d) Copper and Silver

3. In intrinsic semiconductors, number of electrons _____ number of holes.

   (a) Equal (b) Greater than
   (c) Less than (d) Can not define

4. Fermi energy level for intrinsic semiconductors lies

   (a) At middle of the band gap (b) Close to conduction band
   (c) Close to valence band (d) None of these

5. Basic source of magnetism

   (a) Charged particles alone (b) Movement of charged particles
   (c) Magnetic dipoles (d) Magnetic domains

6. In superconductivity, the electrical resistance of material becomes

(a) Zero (b) Infinite
(c) Finite (d) All the above

7. High dielectric constant material is must for

(a) Insulation of wires (b) Generators
(c) Switch bases (d) Generators

8. The word 'ceramic' meant for

(a) soft material (b) hard material
(c) burnt material (d) dry material

9. The size of nano particles is between _____ nm.

(a) 100 to 1000 (b) 0.1 to 10
(c) 1 to 100 (d) 0.01 to 1

10. "There is plenty of room at the bottom." This was stated by

(a) Eric Drexler (b) Richard Feynmann
(c) Harold Croto (d) Richard Smalley

PART - B (5 x 2 = 10 Marks)

11. State Widemann-Franz law.

12. Compare and contrast the properties of germanium (Ge) and gallium arsenide (GaAs) semiconducting materials.

13. In a magnetic material the field strength is found to be 10^6 ampere/m. If the magnetic susceptibility of the material is 0.5×10^{-5}, calculate the intensity of magnetization.

14. State any two properties of dielectric materials.

15. Mention the applications of nano materials in electronics.

PART - C (5 x 16 = 80 Marks)

16. (a) Using quantum concepts and Fermi distribution function, calculate the electron density in a metal. (16)

Or

(b) Using the postulates of Drude-Lorentz theory, derive the expression for electrical conductivity and thermal conductivity of copper. Given: n-electron density in copper, copper, V_d-drift velocity of electrons, v-thermal velocity of electrons. (16)

17. (a) Derive an expression for number of electrons in conduction band of an intrinsic semiconductor. (16)

Or

(b) What is Hall Effect? Derive an expression for Hall coefficient for an n type semiconductor. Describe an experimental arrangement to determine Hall coefficient. (16)

18. (a) (i) Describe the method to draw the hysteresis loop for a ferromagnetic material and also explain the various parts of the loop. (10)

(ii) Based on the area of the hysteresis loop classify the ferromagnetic materials. (6)

Or

(b) (i) Explain the BCS theory of superconductivity. (10)

(ii) Explain the construction, working and applications of CRYOTRON. (6)

19. (a) Explain the frequency and temperature dependence of polarization. (16)

Or

(b) What are ceramic materials? Explain the mechanical, electrical and optical properties of ceramic materials? (16)

20. (a) Explain the preparation of nano materials by ball milling technique. (16)

Or

(b) What is bottom up approach? Explain the preparation of nano materials by chemical vapour deposition technique. Mention the applications of CVD. (16)

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