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

Question Paper Code : 11009

B.E./B.Tech. DEGREE EXAMINATION, JUNE 2011.

Common to all B.E./B.Tech.

Second Semester

182202 — ENGINEERING PHYSICS — II

(Regulation 2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is density of energy states?

2. Calculate the relaxation time for aluminium at 273 K, whose conductivity is $4\times10^{7}\ /\Omega m$, and number of atoms/unit volume is $18.1\times10^{28}/m^{3}$.

3. Sketch the fermi energy level of an intrinsic semiconductor.

4. A sample of n-type semiconductor with a current of current density 50 A/m^2, flowing across it, is subjected to a transverse magnetic field of 0.2 T. If the hall field developed is 3×10^{-4} V/m, calculate the concentration of conduction electrons.

5. Sketch the ordering of atomic magnetic moments in antiferromagnetic materials and ferrites.

6. What are cooper pairs?

7. Determine the dipole moment and displacement of the centroids of positive and negative charges for a neon atom in an electric field of 5×10^{-4} V/m. The atomic polarizability of neon is $4.3\times10^{-41}\ Fm^2$.

8. What are dielectric loss and dielectric breakdown?

9. What is two way memory effect in shape memory alloys?

10. Give an account on the mechanical properties of Carbon nanotubes.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Based on classical free electron theory, arrive at the microscopic form of ohm's law. (8)

(ii) What is Fermi distribution function? Give the energy band structure of a conductor. (8)

Or

(b) (i) Based on classical free electron theory, arrive at the Wiedmann – Franz Law. (12)

(ii) Draw a graph showing the variation of fermi level with change in temperature for a conducting material and explain it. (4)

12. (a) (i) What is an intrinsic semiconductor? Obtain a mathematical expression, for the carrier concentration in intrinsic semiconductor. (12)

(ii) What are compounded semiconductors? How do they differ from elemental semiconductor? (4)

Or

(b) (i) Obtain an expression for fermi level of a p-type semiconductor and show that at O K, the fermi level lies, at the middle of the acceptor energy level and the top most energy level of the valence band. (8)

(ii) What is Hall effect? Obtain expressions to find Hall coefficient and Hall voltage. Mention any two applications of Hall effect. (8)

13. (a) (i) Explain the hysteresis effect of a ferromagnetic material, based on domain theory. Differentiate between hard and soft magnetic materials. (10)

(ii) Write short notes on :

(1) BCS theory. (3)

(2) High Temperature superconductors. (3)

Or

(b) (i) What is the origin of magnetism in materials? Hence explain the classification of the magnetic materials as diamagnetics, paramagnetics and ferromagnetics. (8)

(ii) Write short notes on :

(1) Ferrites

(2) Type I and Type II superconductors. (4 + 4)

14. (a) (i) What is polarization? Mention the different mechanisms of polarizations in different dielectric materials. (8)

(ii) Discuss the dependence of frequency and temperature of the dielectric constant of the material. (8)

Or

(b) (i) Deduce an expression for the local field in a solid dielectric and hence derive the Claussius-Mosotti equation. (8)

(ii) What is ferroelectricity? Explain the hysteresis effect of it. Give a few examples and applications of ferroelectric materials. (8)

15. (a) (i) Give the properties, preparation and application of metallic glasses. (8)

(ii) What are nanomaterials? Explain any two methods of preparation of them. (8)

Or

(b) (i) What are shape memory alloys? Give the properties and applications of them. (8)

(ii) What are Carbon nanotubes? Describe with a neat figure, the chemical vapour deposition method of fabrication of CNT. (8)