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

Question Paper Code : 91782

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Second Semester

Civil Engineering

PH 2161/PH 23/080040002 — ENGINEERING PHYSICS — II

(Common to all branches)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define electrical resistivity. Write its unit.
2. Find the lowest energy of a free electron in a box of side 1 Å each. Write the energy in eV.
3. Electrical conductivity decreases in metals when temperature increases whereas in semiconductor, conductivity increases. Why?
4. Distinguish between direct band gap and indirect band gap semiconductors.
5. What is the origin of magnetic moment?
6. What are cryotron switches?
7. Define dielectric constant.
8. Mention some liquid insulating materials.
9. Give any two applications of metallic glasses.
10. What are the different types of carbon nano tubes?

PART B — (5 × 16 = 80 marks)

11. (a) (i) State the postulates of classical free electron theory and derive an expression for thermal conductivity of metals (12)

(ii) A copper wire whose radius is 0.08 cm carries a steady current of 10 A. Calculate the current density of the wire and drift velocity of the free electron. ($n = 8.46 \times 10^{28}/m^3$). (4)

Or

(b) (i) Derive an expression for the number of allowed states per unit volume of a solid. (8)

(ii) Prove that the average energy of a free electron in metal is 3 $E_{FO/5}$. (8)

12. (a) (i) Obtain expression for Fermi energy of an intrinsic semiconductor and explain how does it vary with the temperature. (8)

(ii) Derive a relation for Fermi energy of N-type semiconductor and sketch a diagram for variation of Fermi energy with temperature for N-type semiconductor. (8)

Or

(b) (i) Describe the Hall effect experiment to determine the Hall coefficient of semiconductor. (12)

(ii) The Hall coefficient of a silicon specimen was found to be -7.35×10^{-5} m^3c^{-1} from 100 to 400 K. Determine the nature of the semiconductor and its density of charge carrier. (4)

13. (a) (i) With a neat sketch, explain the hysteresis of ferromagnetic materials. (10)

(ii) Distinguish between hard and soft magnetic materials with example. (6)

Or

(b) (i) Explain the BCS theory of superconductivity. (8)

(ii) Write notes on High-Tc superconductors and SQUID. (8)

14. (a) (i) What is electronic polarization? Derive an expression for electronic polarizability. (8)

(ii) Explain the frequency and temperature dependence of various polarization mechanisms in dielectric materials. (8)

Or

(b) (i) Explain the intrinsic and discharge dielectric break down mechanisms. (8)

(ii) Write short notes on ferroelectric and pyroelectric materials. (8)

15. (a) (i) Explain the Rapid quenching method for the preparation of metallic glasses and its properties. (8)

(ii) Explain the theory of Shape Memory Effect. (8)

Or

(b) (i) Describe any two methods of production of nano materials. (8)

(ii) Explain the different properties of nano materials. (8)
