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

Question Paper Code : 97253

B.E./B.Tech. DEGREE EXAMINATION, DECEMBER 2015/JANUARY 2016.

Second Semester

Civil Engineering

PH 6251 — ENGINEERING PHYSICS – II

(Common to all branches except Biotechnology and Pharmaceutical Technology)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. The Fermi energy of copper is 7.0 *eV*. Find the Fermi velocity of the electrons.

2. The conduction electron density in aluminum is 18.1×10^{28} *electrons*/m^3. Calculate the Fermi energy of aluminum.

3. How many pentavalent atoms per cm^3 has to be added to an intrinsic silicon semiconductor to produce a n-type semiconductor with electrical conductivity of $5\Omega^{-1}cm^{-1}$ at room temperature. (Assume that all the donor atoms are ionized at room temperature).

4. What is a Hall probe? How it is used to measure magnetic flux density?

5. What is hysteresis?

6. Give the differences between conventional superconductors and high temperature superconductors.

7. What are ferroelectric materials?

8. Define dielectric loss.

9. Define the term birefringence.

10. What is shape-memory effect?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss Drude-Lorentz theory of metals. Derive an expression for electrical and thermal conductivity of metals and hence prove Wiedemann-Franz law. (2 + 12 + 2)

Or

(b) Derive an expression for density of energy states, hence deduce an expression for conduction electron density in metals. (12 + 4)

12. (a) Derive an expression for Fermi energy level for an intrinsic semiconductor and show that it lies in the middle of the band gap at T = 0 K. Discuss how the Fermi level changes with temperature. (12 + 4)

Or

(b) Derive an expression for concentration of holes in a p-type semiconductor. Discuss how a p-type semiconductor behaves at various temperature with a graph. (12 + 4)

13. (a) Explain the origin of magnetism in materials and the classification of dia, para, ferro, antiferro and ferri magnetic materials with suitable examples. (16)

Or

(b) (i) Explain Transition temperature, Meissner effect, critical magnetic field and Isotope effect in superconductors. (12)

(ii) Explain any two applications of superconductors (4)

14. (a) (i) Derive an expression for electronic and ionic polarization. (12)

(ii) Explain the use of dielectric material in transformers and capacitors. (4)

Or

(b) (i) What is dielectric breakdown? Explain the different mechanism by which a dielectric material losses its insulating property. (12)

(ii) How does a dielectric material behaves in a A.C field of different frequency. (4)

15. (a) What are metallic glasses? Discuss the method of preparing metallic glasses, the characteristic properties exhibited by them and their applications. (16)

Or

(b) What are biomaterials? Discuss the classification of biomaterials and their uses in the field of medicine with suitable examples. (16)