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

Question Paper Code : 53539

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Second Semester

Civil Engineering

PH 6251 — ENGINEERING PHYSICS – II

(Common to all branches)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the properties of metals described inadequately by Drude's model?
2. Define the mobility of electrons.
3. What is Hall voltage? Which property of an extrinsic semiconductor depends on Hall voltage?
4. The electrical resistivity of certain intrinsic semiconductor is 0.40 Ω m. The electron and hole mobilities are 0.64 $m^2 V^{-1}s^{-1}$ and 0.36 $m^2 V^{-1}s^{-1}$ respectively. Calculate the electron and hole densities.
5. Liquid oxygen in a test tube is suspended between the pole pieces of a magnet. How does it behave? What type of magnetic material is liquid oxygen?
6. The critical field for niobium at 0 K is 2 × 10 A/m and 1 × 10^5 Am/at 8 K. Calculate the transition temperature of the element.
7. What are the uses of dielectric material?
8. Define dielectric loss.
9. Why metallic glasses are used as transformer core materials?
10. What is Kerr effect?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the essential concepts of classical free theory of metals and quantum free electron theory of metals? Discuss the success and failures of both the theories.

(ii) Derive an expression for electrical conductivity of metals based on the concepts of classical free electron theory.

(iii) A copper wire 3.2 mm in diameter, carries a current of 0.5 A. Valency of copper is one. Atomic weight and density of copper are 63.5 and 8900 kg/m^3 respectively. Calculate the speed of conduction electrons.

Or

(b) (i) What is meant by Fermi energy in metals? Based on quantum theory derive an expression for density of energy states, hence obtain an expression for Fermi energy.

(ii) The Fermi energy for Al is 11.7 eV. Find the probability that the state with energy 11.8 eV be occupied at 0 K and at room temperature (300 K.).

12. (a) Derive the expressions for intrinsic carrier concentration and electrical conductivity of an intrinsic semiconductor. Explain the variation of electrical conductivity with temperature and band gap of the semiconductor.

Or

(b) Explain *p*-type semiconductor and derive an expression for the position of Fermi level. Explain the behaviour of this semiconductor at high temperature.

13. (a) (i) Distinguish between hard and soft magnetic materials with their applications.

(ii) Write a note on ferrites. Give reasons why ferrites are preferred over ferromagnetic materials as core materials for high frequency applications.

Or

(b) (i) Distinguish between type I and type II superconductors.

(ii) Explain BCS theory of superconductivity.

(iii) Explain SQUID.

14. (a) Explain the different types of polarization mechanisms in dielectrics and sketch their dependence on the frequency of applied electric field.

Or

(b) What is meant by local field in a dielectric and how it is calculated for a cubic structure? Deduce Clausius-Mosotti relation.

15. (a) What are metallic glasses? Explain how they are prepared by melt spinning method. Also mention their application.

Or

(b) Explain with necessary diagrams the synthesis of nanomaterials using the following methods :

(i) Chemical vapour deposition

(ii) Pulsed laser deposition.
