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

Question Paper Code : 97179

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

Second Semester

Civil Engineering

PH 2161 — ENGINEERING PHYSICS — II

(Common to all Branches)

(Regulations 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. Give any two example of pentavalent and trivalent impurities.

4. Name any two compound semiconductor with applications.

5. In what form data are stored in magnetic tapes?

6. What are Cooper pairs?

7. Define dielectric constant.

8. Distinguish between dielectric loss and dielectric breakdown.

9. Sketch the two phases which occur in shape memory alloy.

10. Mention the properties of carbon nano tube.

PART B — (5 × 16 = 80 marks)

11. (a) (i) List the drawbacks of classical free electron theory. (4)

(ii) Obtain Wiedemann Franz law using the expressions of electrical and thermal conductivity and find the expression for Lorentz number. (4)

(iii) The density of silver is 10.5×10^3 kg/m^3. The atomic weight of silver is 107.9. Each silver atom provides one conduction electron. The conductivity of silver at $20^\circ C$ is $6.8 \times 10^7\ ohm^{-1}\, m^{-1}$. Calculate the density of electrons and also the mobility of electrons in silver. (4)

(iv) Calculate the electrical and thermal conductivities of a metal with the relaxations time of 10^{-14} second at 300 K. The electron denisty is $6 \times 10^{26}\, m^{-3}$. (4)

Or

(b) (i) Derive an expression for electrical conductivity based on quantum theory. (8)

(ii) Write the expression for Fermi distribution function and explain with suitable diagram. How does it vary with temperature? (4)

(iii) Calculate the Fermi energy and Fermi temperature in a metal. The Fermi velocity of electrons in the metal is 0.86×10^6 m/s. (4)

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 $-7.35 \times 10^{-5}\, m^3 c^{-1}$ from 100 to 400 K. Determine the nature of the semiconductor and its density of charge carrier. (4)

13. (a) (i) Discuss the various energies involved in the formation of domains. (8)

(ii) Write an essay on ferrites. (8)

Or

(b) Write short note on :

(i) Properties of superconductor. (8)

(ii) Applications of superconductor. (8)

14. (a) (i) Define the following :

(1) Dielectric constant ε_r

(2) Polarizability, α.

(3) Polarization vector, $\vec{P}$

(4) Electric flux density, D

(5) Electric susceptibility. χ.

Give also the necessary equations relating the above quantities. (12)

(ii) Calculate the electronic polarizability of an argon atom whose $\varepsilon_r = 1.0024$ at NTP and $N = 27 \times 10^{25}$ atoms/m^3. (4)

Or

(b) (i) Define 'internal field'. Obtain the expression for internal field using Lorentz method and hence deduce the Clausius-Mosotti equation. (12)

(ii) The atomic weight and density of sulphur are 32 and 2.08 gm/cm^3 respectively. The electronic polarizability of the atom is $3.28 \times 10^{-40}\ Fm^2$. If sulphur solid has cubic symmetry, what will be the relative permittivity? Take Avogadro number as 6.023×10^{26}, $\varepsilon_0 = 8.86 \times 10^{-12}\ Fm^{-1}$. (4)

15. (a) Explain the characteristics of Shape Memory Alloy and mention its advantages and disadvantages. (16)

Or

(b) (i) Describe plasma arcing technique with a diagram fabricate nano particles. (8)

(ii) Explain how are carbon nano particles fabricated using Laser deposition method. (8)