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

Question Paper Code : 74086

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Second Semester

Civil Engineering

PH 2161/PH 23/080040002 — 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 mean free path of an electron.

2. Define Fermi level.

3. Write an expression for electrical conductivity of an intrinsic semiconductor.

4. What are the differences between elemental semiconductor and compound semiconductor?

5. Write any two applications of Ferrites.

6. State the principle of Magnetic Levitation.

7. What are the factors involved in dielectric loss in a dielectric material?

8. An atom has a polaraisibility of 10^{-40} Fm^2. It finds itself at a distance of 1.0 nm from a proton. Calculate the dipole moment induced in the atom. $(\varepsilon_0 = 8.85 \times 10^{-12})\ Fm^{-1}$.

9. Give any two applications of metallic glasses.

10. What are the different types of carbon nano tubes?

PART B — ($5 \times 16 = 80$ marks)

11. (a) Obtain an expression for electrical and thermal conductivities based on classical free electron theory and prove the Wiedmann-Franz law. (16)

Or

(b) Obtain an expression for fermienergy at temperature $T = O^K$ and relate it to fermi energy at non zero temperature. (16)

12. (a) (i) Obtain an expression for the carrier concentration of electrons in an intrinsic semiconductor. (10)

(ii) Starting with the conductivity of charge carriers in an intrinsic semiconductor, describe how will you determine the bandgap of an intrinsic semiconductor. (6)

Or

(b) (i) Explain the phenomenon of Hall effect. (2)

(ii) Derive an expressions for Hall coefficient for a n-type semiconductor and for p-type semiconductor. Also state how Hall voltage is related. (10)

(iii) A magnetic flux density of 0.5 Wb/m^2 is applied from front to back, perpendicular to largest faces of a specimen. A current of 20 mA flows lengthwise and the voltage measured across its width is 37 μV. The dimensions of the specimen is 12 mm long, 1 mm wide and 1 mm thick. Find the Hall coefficient. (4)

13. (a) (i) With a neat sketch, explain the hysteresis of ferromagnetic materials. (8)

(ii) Distinguish between hard and soft magnetic materials with example. (8)

Or

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

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

14. (a) Define Electronic and Ionic polarisation and explain them with a neat diagram. Deduce Clausius – Mosotti equation. (16)

Or

(b) Define dielectric, breakdown. Explain five types of dielectric breakdown occur in dielectric materials. (16)

15. (a) (i) What are shape memory alloys? Describe the characteristics and applications of shape memory alloys. (8)

(ii) How metallic glasses are prepared and mention their properties and applications? (8)

Or

(b) (i) What are nanoparticles? Explain how nanoparticles can be produced using ball-milling technique. (2 + 6)

(ii) Describe the mechanical, chemical and magnetic properties of nanoparticles. (8)
