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

Question Paper Code : 80285

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

Second Semester

Computer Science and Engineering

PH 8252 — PHYSICS FOR INFORMATION SCIENCE

(Common to Information Technology)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Wiedemann-Franz law.
2. Distinguish between electron rest mass and effective mass.
3. How does the carrier concentrations in semiconductors vary with temperature?
4. Outline the features of Schottky diode.
5. Show the magnetic dipole alignment in ferro, anti-ferro and ferrimagentism.
6. What are magnetic domains?
7. Comment on the blue color of the sky.
8. Why organic LED is called so?
9. Define the term quantum confinement.
10. List the various low dimensional systems.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the Classical free electron model of materials and deduce an expression for the electrical conductivity. Also discuss the success and failures of this model.

Or

(b) (i) Contrast the terms degenerate and non- degenerate states. (6)

(ii) Derive the energy value of a particle in a three dimensional box. (10)

12. (a) (i) Discuss the direct and indirect band gap semiconductors. (10)

(ii) Silicon crystal is doped with atoms 5×10^{20} per m^3. The donor level is 0.05 eV from the edge of the conduction band. Taking the band gap to be 1.12 eV, calculate the position of the Fermi level at 200 K. (6)

Or

(b) (i) Describe Hall effect. Mention its significances. (10)

(ii) A semiconducting crystal, 12 mm long, 5 mm wide and 1 mm thick, has a magnetic flux density of 0.5 Weber/m^2 applied from front to back perpendicular to the largest faces. When current of 20 mA flows lengthwise through the specimen, the voltage measured across its width is found to be 37 μV. What is the Hall coefficient of this semiconductor? (6)

13. (a) (i) Categorize magnetic materials and tabulate its properties and applications. (12)

(ii) The magnetic susceptibility of silicon is -0.4×10^{-5}. Calculate the flux density and magnetic moment per unit volume when field of intensity 5×10^5 A/m is applied. (4)

Or

(b) (i) Draw the Hysteresis curve of typical ferromagnetic materials and explain it through domain concept. (10)

(ii) Identify the relevant magnetic properties used for memory storage. (6)

14. (a) (i) Explain the terms associated with optical materials (12)

(1) Luminescence

(2) Kerr effect

(3) Recombination.

(ii) Compare the absorption, emission and scattering of light in metals and semiconductors. (4)

Or

(b) Illustrate the working and I-V characteristics of (i) Solar cell and (ii) Organic LEDs and (iii) laser diodes.

15. (a) (i) Define Fermi energy and explain how it depends on the size of the materials? (4)

(ii) Demonstrate the effect of quantum confinement in low dimensional systems and Obtain the expression for DOS. (12)

Or

(b) Describe the construction and working of (i) nano diodes (ii) SET (iii) Quantum dot lasers.
