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

Question Paper Code : 91143

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Second Semester

Computer Science and Engineering

PH 8252 — PHYSICS FOR INFORMATION SCIENCE

(Common to Information Technology)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State Wiedemann-Franz law.
2. Calculate the Fermi function at an energy $E = E_F + kT$ at room temperature $T = 300\ K$ and plot the function. Given that $k = 1.38 \times 10^{-23}$ J/K.
3. What are intrinsic semiconductors? Give examples.
4. Define Hall effect.
5. Define Magnetic dipole moment.
6. What is a GMR sensor?
7. Differentiate radiative recombination and non-radiative recombination processes.
8. What are the advantages of organic LED?
9. List any two forms of nanostructured materials.
10. Draw the energy bandgap structure of metals and semiconductors.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive expressions for drift velocity and electrical conductivity for a conducting material kept in an electric field. (10)

(ii) List the assumptions and drawbacks of Classical Free Electron Theory. (6)

Or

(b) (i) Derive an expression for the Density of energy states in a solid. (8)

(ii) Explain how allowed and forbidden energy bands arise when electrons move in a periodic potential in a crystal lattice. (8)

12. (a) Derive an expression for obtaining electron concentration in intrinsic semiconductor and n-type semiconductor. (16)

Or

(b) Obtain an expression for Fermi energy level E_F in terms of impurity concentration and temperature in P & N type semiconductors. Discuss the behaviour with a neat sketch. (16)

13. (a) Write short notes on diamagnetism, paramagnetism, ferromagnetism and antiferromagnetism. (16)

Or

(b) Explain the origin of ferromagnetism and exchange interaction in magnetic materials. Discuss the M versus H behavior using domain theory. (16)

14. (a) Explain the construction and working of a P-N junction diode and solar cell. (16)

Or

(b) Explain the construction and working of an LED and Laser Diodes. (16)

15. (a) Formulate expressions for density of states in quantum well, quantum wire and quantum dot structures. (16)

Or

(b) Explain the construction and working of a single electron transistor. (16)