Question Paper Code : 312109

B.E./B.Tech. DEGREE EXAMINATIONS November/December 2023.

First Semester

Artificial Intelligence and Data Science

PH23111— PHYSICS FOR INFORMATION SCIENCE

(Common to: Artificial Intelligence and Machine Learning)

(Regulations 2023)

Time : Three Hours | Maximum : 100 Marks

Answer ALL Questions

PART A (10x2=20 Marks)

1. What are the drawbacks of the classical free electron theory of metals?
2. Evaluate the Fermi function for an energy kT above the Fermi energy.
3. Differentiate direct and indirect band gap semiconductors.
4. List the properties of semiconductors.
5. Calculate the magnetization of a material whose magnetic field intensity is 10^4 A/m and the susceptibility at room temperature is 3.7×10^{-3}.
6. What is domain theory of ferromagnetism?
7. How LASER is different from LED?
8. What is the basic principle of photo diode?
9. Define Qubits.
10. Write the advantages of quantum computing over classical computing.

PART B — (5x16= 80 Marks)

11. (a) Using the classical free electron theory, derive the mathematical expressions for the electrical conductivity and thermal conductivity of metals and hence deduce Wiedemann-Franz law.

Or

(b) Derive an expression for the density of energy states, based on that deduce the expression for carrier concentration in metals.

12. (a) Assuming Fermi-Dirac distribution derive an expression for the concentration of electrons per unit volume in the conduction band of an intrinsic semiconductor

Or

(b) Derive an expression for Hall coefficient of an n-type semiconductor. Also state how Hall voltage is related?

13. (a) Compare dia, para and ferromagnetic materials on the basis of spin.

Or

(b) What are GMR sensors? Explain the working of magnetic hard disc based on GMR sensor.

14. (a) Summarize the three types of carrier generations and recombination processes in semiconductors.

Or

(b) Explain with neat sketch the principle, working and applications of organic LEDs.

15. (a) Explain the construction and working of CNOT gate with truth table.

Or

(b) How qubit is represented mathematically with help of Bloch sphere.
