AIML 2nd

(T) Roll No. .....

PAPER ID—10704

B.Tech. EXAMINATION, 2026

(Second Semester)

PHYSICS

Time : 3 Hours *Maximum Marks : 70*

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) Calculate the energy of a system of three charges each +q located a the corner of an equiltateral triangle of side a. **2**

   (b) What is the significance of polarization of dielectrics ? **2**

   (c) What are the distinguish features of ferromagnetic ? **2**

   (d) Explain significance of Huygens' principle in wave optics. **2**

   (e) Explain the term carrier generation and recombination in semiconductors. **2**

   (f) Write down the properties of laser light. **2**

   (g) Distinguish between intrinsic and extrinsic semiconductors with examples. **2**

Unit I

2. (a) Discuss the potential and field due to an electric dipole. **6**

   (b) Give the derivation of electric field from electrostatics potential. **5**

   (c) The potential function at a point is given by $v = x(3y^2 - x^2 + z)$. Find the component of electrostatic field at that point. **3**

3. (a) Calculate the electric field intensity required to just support an ion of mass 10^{-5} gm and having a charge of 2.5 C in air. **3**

   (b) Calculate the electric potential energy of a system of charges. **7**

(c) Derive Laplace's equations for electrostatic potentials. What is its importance in physics ? 4

Unit II

4. (a) State and explain the laws of electrostatics. 7

(b) Write a short note on dia, para and ferromagnetism. Also explain the applications of magnetic materials. 7

5. (a) What is meant by dielectric polarization ? Define the term permeability and dielectric constant. 3

(b) Explain the laws of magnetism. 5

(c) Derive the Maxwell's equation and also write down their significance. 6

Unit III

6. (a) Explain the Fraunhofer diffraction due to a circular aperture. 6

(b) Explain the basic principle, construction and working of a CO laser. 5

(c) Explain the Rayleigh criterion of resolution and its application to vision. 3

7. (a) Explain in detail the Young's double slit experiment. 6

(b) What are Einstein A and B coefficients and derive the relation them. 5

(c) What is the highest order spectrum which may be seen with the light of wavelength 8×10^{-5} cm by means of a grating with 4500 lines/cm ? Calculate the wavelengths in the visible spectrum which coincide with the sixth order spectrum of this light. **3**

Unit IV

8. (a) Describe Kronig-Penney model for motion of electron in a periodic potential. Show from E-K graph that materials can be classified in to metals, insulators and semiconductors. **10**

(b) Explain the free electron theory of metals. Also write down the limitations of this theory. **4**

9. (a) Explain Fermi level in semiconductors. Also explain how Fermi energy varies with temperature. **8**

(b) Derive the expression for density of states in 1D, 2D and 3 D. **6**

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