No. of Printed Pages : **2**

21PHY4C12L

Sl. No.

M.Sc. IV Semester Degree Examination, Sept./Oct. - 2024

PHYSICS

Electromagnetics

(NEP)

Time : 3 Hours Maximum Marks : 70

Note : *Answer* ***any five*** *of the following questions with* ***Question No.1 (Q1)*** *is* ***Compulsory****, each question carries* ***equal*** *marks.*

1. (a) State and explain the first and second uniqueness theorems with suitable examples. **10**

(b) Explain the divergence and curl of electrostatic field. **4**

2. (a) Derive the multipole expansion of the magnetic vector potential. Obtain the expressions for the dipole and quadrupole terms. **10**

(b) Write a note on torques and forces on magnetic dipoles. **4**

3. (a) Explain the phenomenon of dielectric hysteresis in materials subjected to an alternating electric field. **6**

(b) Explain the concept of eddy current and displacement current. **8**

4. (a) Derive the Lienard-Wiechert potentials for a moving point charge. **7**

(b) Derive the expression for the power radiated by an accelerating point charge. **7**

5. (a) What are waveguides ? Explain the propagation of electromagnetic waves in a conducting medium. **9**

(b) List out the characteristics of TE waves in a rectangular waveguide. **5**

6. (a) Discuss in detail the effect of magnetic field on matter. **7**

(b) Discuss on the alternating current behaviour of ferromagnetic materials. **7**

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7. (a) What are gauge transformations ? Explain the concept of Lorentz gauge and Coulomb gauge. **6**

(b) Derive the expression for the magnetic dipole radiation with suitable approximations. **8**

8. (a) Explain the effect of a magnetic field on atomic orbits. **5**

(b) Write a note on retarded potential. **4**

(c) With suitable general relations, explain the reflection at a conducting surface. **5**

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