A–0434

Total Pages : 3 **Roll No. .....**

MSCPH-508

Master of Science Physics (MSCPH)

Electrodynamics

Examination, June 2025

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Discuss Laplace equation for electric potential in one, two and three-dimensional space.

2. Discuss magnetic vector potential ? Find the vector potential of an infinite solenoid with *n* turns per unit length, radius R and current I.

3. What do you meant by Cerenkov Radiation. Also differentiate between Cerenkov Radiation and Bremsstrahlung radiation.

4. Explain Maxwell's equation in free space and in matter.

5. What do you mean by wave guide ? Prove that TEM waves cannot occur in hollow wave guide.

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Establish an expression for the electrostatic energy of an assembly of point charges. Find the energy of a uniformly charged spherical shell of total charge q and radius R.

2. Discuss Gauss law in the presence of dielectric.

3. Explain susceptibility, Permittivity, Dielectric Constant for a linear dielectric and establish a mathematical relation between these parameters.

4. A sphere of homogeneous linear dielectric material is placed in an otherwise uniform electric field E_0. Find the electric field inside the sphere.

5. What is linear and non-linear media ? Establish a relation between permeability and magnetic susceptibility.

6. What is displacement current ? How Maxwell fixed Ampere's law ?

7. Discuss the propagation of electromagnetic waves in linear media and obtain the expression of refractive index of media.

8. Discuss the propagation of TE waves in a rectangular wave guide.

****