K-417

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

MSCPH-508

ELECTRODYNAMICS

M.Sc. Physics (MSCPH)

2nd Semester Examination, 2023 (Dec.)

Time : 2 Hours] **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)

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.

(2×19=38)

1. Define electromagnetic field tensor $F_{\mu o}$ and prove the Lorentz covariance of Maxwell's electromagnetic field equations.

2. Describe the electromagnetic wave propagation in conducting medium. Write the corresponding boundary conditions at the interface of conducting medium.

3. Derive an expression for Lienard-Witchart potential. How are these related with conventional potential?

4. How the concept of four vector originated from Lorentz transformations? Discuss the four-vector formulation of energy and momentum.

5. Obtain the expression of velocity for TE wave in a rectangular wave guide. Discuss the equation of electrostatic and equation of magnetostatic in a coaxial transmission line.

SECTION–B

(Short Answer Type Questions)

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. (4×8=32)

1. How much work it would take to assemble an entire collection of point charges?

2. Discuss Lotentz force law and prove that work done by magnetic force is zero.

3. How was the electrodynamics before Maxwell and how Maxwell fixed Ampere's law?

4. Discuss in brief, how the radiation from an accelerated charge takes place? Also write the expression for the fields of an accelerated charge.

5. A sphere of homogeneous linear dielectric material is placed in an external uniform electric field E_o. Prove that the electric field inside the sphere will be $E = \frac{3}{\epsilon_r + 2} E_o$.

6. Obtain an expression for the energy stored in a dielectric system in terms of electric displacement vector and electric field. Also discuss spring energy.

7. What is skin depth in context of electromagnetic wave? Obtain an expression of it in terms of electric conductivity.

8. Obtain a relation between conduction current and displacement current in terms of characteristic impedance of the medium.
