A–1180

Total Pages : 4 **Roll No. .....**

MSCPH-508

M.Sc. Physics (MSCPH)

Electrodynamics

Examination February, 2026

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. Show that the four vector potential of electrodynamics can be expressed as Lienard- Wiechert potential. Define the electromagnetic field tensor F_{UV}.

2. Derive Maxwell equations. Write physical significance of these equations.

3. What do you understand by reflected and transmitted waves ? Derive Fresnel's equations relating them.

4. Explain D'Alembertian operator and show that the D'Alembertian operator is invariant under Lorentz transformation.

5. What do you understand by Larmor's formula describes the power radiated by an accelerated charge particle.

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. Explain the Lorentz invariance of Maxwell's equations. How does it ensure that the laws of electromagnetism are the same in all inertial frames ?

2. Write short notes on the following :

   (a) Characteristic impedance

   (b) Reflection coefficient

   In transmission of waves.

3. Explain the ampere circuital law. Derive its differential form.

4. Find the electric field produced by a uniformly polarized sphere of radius R.

5. What will be the power radiation for a relativistically accelerated charge particle with velocity and acceleration in perpendicular direction ? Give one example for such radiation.

6. The electric field in a region is radially outwards with magnitude E = Ar. Find the charge contained in a sphere of radius a centred at the origin. Take A = 100 V/m^3 and a = 20.0 cm.

7. What do you understand by magnetic susceptibility and relative permeability and establish relation between them.

8. Write short notes on the following :

   (a) Equation of continuity formula

   (b) Cerenkov radiation

****