



K23P 3283

Reg. No. :

Name :

**First Semester M.Sc. Degree (CBSS-Supple. (One Time Mercy Chance)/
Imp.) Examination, October 2023
(2014 to 2022 Admissions)
PHYSICS
PHY1C03 – Electrodynamics**

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer both questions either **a** or **b**. **Each** question carries **12** marks. **(2×12=24)**

1. a) Describe the reflection and transmission of electromagnetic waves in matter at normal incidence.

OR

- b) Obtain the expression for total power radiated from an electric dipole.

2. a) Derive the Maxwell's equations and Lorentz force in tensor equation.

OR

- b) Explain gauge transformations. Obtain Lorentz Gauge condition.

SECTION – B

Answer **any four** questions. Question (a) carries **1** mark. (b) carries **3** marks. (c) carries **5** marks. **(4×9=36)**

3. a) What is meant by advanced potentials ?
- b) A charge of 4×10^{-8} C is distributed uniformly on the surface of a sphere of radius 1cm. It is covered by a concentric, hollow conducting sphere of radius 5 cm. Find the electric field at a point 2 cm away from the centre. A charge of 6×10^{-8} C is placed on the hollow sphere. Find the surface charge density on the outer surface of the hollow sphere.
- c) How did Maxwell fix Ampere's law ?

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4. a) What is Poynting Vector ?
- b) Discuss Poynting theorem.
- c) Obtain electromagnetic wave equation in free space.
5. a) What are the boundary conditions for magnetic field ?
- b) Explain why excellent conductors make good mirrors.
- c) Show that electromagnetic waves are transverse in nature.
6. a) Define Minkowski force.
- b) Show that $E^2 - c^2 B^2$ is relativistically invariant.
- c) Obtain the relativistic continuity equation directly from Maxwell's equations.
7. a) What is meant by polarized Electromagnetic wave ?
- b) Why does TEM mode not occur in a hollow wave guide ?
- c) Obtain the expression for the cut off frequency for the TE waves in Rectangular Wave Guide.
8. a) What is magnetic vector potential ? What is its SI unit ?
- b) Find the magnetic field of a very long solenoid, consisting of n closely wound turns per unit length on a cylinder of radius R , each carrying a steady current I .
- c) List Maxwell equations and mention their significance.