K22P 1590

Reg. No. : .....

Name : .....

I Semester M.Sc. Degree (CBSS – Reg./Sup./Imp.)
Examination, October 2022
(2019 Admission Onwards)
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) Derive the non-homogeneous wave equations for the scalar and vector potentials.

OR

b) Discuss the theory of reflection and refraction of electromagnetic waves at oblique incidence at the boundary of two non-conducting media.

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

OR

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

SECTION – B

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

3. a) State and explain Gauss's law in electrostatics.
   b) A charge of 4×10^{-8} C is distributed uniformly on the surface of a sphere of radius 1 cm. 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) Discuss any two applications of Gauss law in electrostatics.

P.T.O.

4. a) What is meant by retarded potential ?
   b) Explain why excellent conductors make good mirrors.
   c) How did Maxwell fix Ampere's law ?
5. a) What is Poynting Vector ?
   b) Discuss Poynting theorem.
   c) Show that electromagnetic waves are transverse in nature.
6. a) Write a note on four vectors.
   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 Brewster's law ?
   b) Write a short note on a cavity resonator.
   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) Can a static magnetic field exist in a good conductor ? Explain.
   c) Compare the usefulness of Ampere's circuital law and Biot-Savart law in determining magnetic field (B) of a current -carrying circuit.

———————