



K23P 3101

Reg. No. :

Name :

I Semester M.Sc. Degree (CBCSS – OBE – Regular)
Examination, October 2023
(2023 Admission)
PHYSICS
MSPHY01C03 : Electrodynamics

Time : 3 Hours

Max. Marks : 60

PART – A

(Answer **any five** questions. **Each** question carries **3** marks.)

1. Derive Coulomb's law from Gauss's theorem.
2. What is cyclotron motion ? Derive an expression for the radius of motion.
3. Consider a current I flowing along a uniform long and straight cylindrical wire of resistance R . What are the directions of electric and magnetic fields E and H associated with this current ? What does the Poynting vector of these fields indicate ?
4. Derive the equation of continuity from Maxwell's equations.
5. Express the Lorentz transformations in matrix form.
6. Write down the expression for retarded potentials.

PART – B

(Answer **any three** questions. **Each** question carries **6** marks.)

7. Derive Poynting theorem for plane electromagnetic wave in free space.
8. Discuss the image method for finding potential due to a charge placed in the vicinity of a grounded conducting plane. Derive expressions for the force, energy and induced charge on the conducting plane.

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9. Derive the wave equation for a conducting medium and discuss its dispersive behaviour.
10. Briefly discuss how do the electromagnetic potentials transform under Lorentz transformations.
11. Explain what are retarded potentials.

PART – C

(Answer **any three** questions. **Each** question carries **9** marks.)

12. Discuss how Laplace's equation is solved in spherical coordinates for problems with azimuthal symmetry.
13. Discuss the problem of reflection and refraction of electromagnetic waves at a plane interface between dielectrics.
14. Derive Larmor formula for power radiated by accelerated charge and discuss its relativistic generalisation.
15. Rewrite electromagnetic equations in covariant form.
16. What is a wave guide ? Show that TEM wave cannot be propagated in a closed wave guide. Explain the concept of TE and TM modes.