

(i) Printed Pages : 3 Roll No.

(ii) Questions : 9 Sub. Code :

| | | | |
|---|---|---|---|
| 3 | 7 | 1 | 9 |
|---|---|---|---|

Exam. Code :

| | | | |
|---|---|---|---|
| 0 | 4 | 7 | 4 |
|---|---|---|---|

M.Sc. Physics 3rd Semester

(2123)

CLASSICAL ELECTRODYNAMICS-II

Paper : PHY-8034

Time Allowed : Three Hours]

[Maximum Marks : 60

Note :—Answer FIVE questions in all, selecting ONE question each from Units I–IV and the compulsory questions from Unit–V.

UNIT—I

1. (a) Prove that Lorentz transformations form a group which implies the resultant of two successive Lorentz transformations is a Lorentz transformation. 6
(b) Explain the terms :
 - (i) Four-Velocity
 - (ii) Four acceleration
 - (iii) Four-momentum. 3×2=6
2. (a) Obtain the expression for minimum Kinetic energy of m_2 in the decay $M \rightarrow m_1 + m_2$ using energy-momentum relation for the decay to occur. 6
(b) Construct the four components of four Minkowski force. 6

UNIT—II

3. (a) Discuss the non-relativistic motion of a charged particle in constant uniform magnetic field. Also discuss different conservation laws that hold goods in this case. 6
- (b) Write a note on the following :
- (i) Gradient Drift
- (ii) Curvature Drift 3,3
4. (a) Discuss the relativistic motion of a charged particle in the field of plane electromagnetic wave. 6
- (b) Describe the motion of a non-relativistic charged particle in a slowly varying magnetic field. 6

UNIT—III

5. (a) Derive an expression for the Lagrangian of a charged particle in an electromagnetic field. 8
- (b) Show that the Four-tensor $\boxed{F_{uv}}$ for the electromagnetic field must be totally antisymmetric. 4
6. (a) From principle of least action, obtain the expression of a charged particle in an electromagnetic field. 6
- (b) Starting from the four-dimensional form of homogeneous Maxwell's equations, viz

$$\sum \frac{\partial F^{\mu\nu}}{\partial x^\nu} = 0 \quad (\mu = 0, 1, 2, 3).$$

Obtain the wave equation for the field in a vacuum in the four-dimensional form. 6

UNIT—IV

7. (a) Write a note on Thomson scattering. 6
(b) What are Lienard-Wiechert potentials ? Obtain the expression for retarded scalar potential. 6
8. (a) Write a note on Rayleigh Scattering. 6
(b) Derive an expression for radiated power from an accelerated charge at low velocities. 6

UNIT—V

9. (a) Show that four velocity vector and four acceleration are orthogonal to each other.
(b) What are time like and space like events ?
(c) What is radiation reaction ?
(d) What do you know about the term Bremsstrahlung ?
(e) State postulates of Special theory of relativity.
(f) What is Minkowski space ? 6×2=12