(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 9 Sub. Code : 2 6 1 1 2

Exam. Code : 0 4 7 4

M.Sc. Physics 3rd Semester

(2125)

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 question from Unit V.

UNIT—I

1. (a) Obtain an expression for threshold energy required for the reaction

$m_1 + m_2 + m_3 \rightarrow m_4 + m_5$, using energy-momentum relation, to go through. 6

(b) Construct the four components of four Minkowski force $|K^{\mu}$. 6

2. (a) Using the transformation equations of position four vector, obtain the Lorentz transformation equation. 8

(b) Show that four velocity and four acceleration are orthogonal to each other. 4

UNIT—II

3. (a) Write a note on the following :

I. Gradient Drift

II. Curvature Drift 3,3

(b) Explain the concept of magnetic mirror. State its applications. 6

4. (a) Discuss the motion of a charged particle in crossed and uniform electric and magnetic fields. 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 Hamiltonian of a charged particle in an electromagnetic field. 8

(b) Show that the Four-tensor F_{uv} for the electromagnetic field must be totally antisymmetric. 4

6. (a) Write a short note on covariant formulation of vacuum electrodynamics. 6

(b) Starting from the four-dimensional form of homogeneous Maxwell's equations, viz

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

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

UNIT—IV

7. (a) Derive an expression for the radiated power from an accelerated charge at low velocities. 6

   (b) Derive an expression for the radiated power from an accelerated charge at very high velocity. 6

8. (a) Obtain an expression for the total scattering cross section for an incident plane polarized light by a free electron. 6

   (b) Derive an expression for the absorption cross section by a bound electron. 6

UNIT—V

9. (a) What are cyclotron and synchrotron radiations?

   (b) What is adiabatic invariance of flux?

   (c) Write a note on Lienard-Wiechert potentials.

   (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