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

(ii) Questions : 9 Sub. Code : 3235

Exam. Code : 474

M.Sc. 3rd Semester

1125

PHYSICS

Paper - Phy -7001 : Classical Electrodynamics-II

Time Allowed : Three Hours] **[Maximum Marks : 60**

Note :– Attempt **five** questions in all, taking **one** question each from Units I to IV and the compulsory question from Unit V.

UNIT–I

1. (a) Write a note on Lorentz Transformations. 6

   (b) Using the invarinace of energy and momentum and the invariance of the scalar product of 4-vectors, obtain the expression for total energy of the particle m_2 in the rest frame of decaying particle M, in the reaction $M \rightarrow m_1 + m_2$. 6

2. (a) Write a note on :

   (i) time dilation

   (ii) length contraction. 6

   (b) Using energy-momentum conversation relation, obtain the expression for threshold energy required for the reaction $m_1 + m_2 \rightarrow m_3 + m_4$, to go through. 6

UNIT–II

3. (a) Describe the behavior of charged non-relativistic particle in constant electric field. 6

   (b) Explain the terms :
   (i) Gradient Drift
   (ii) Curvature Drift. 6

4. (a) Describe the behavior of a charged non-relativistic particle in a constant magnetic field. 6

   (b) Describe the behavior of a charged relativistic particle in a constant magnetic field. 6

UNIT–III

5. (a) Starting from four Maxwell equations, obtain the wave equation for $\vec{A}$, ϕ. 6

   (b) Obtain the expression for energy-momentum tensor of the electromagnetic field. 6

6. (a) Starting from Maxwell equations in covariant form, obtain the canonical four Maxwell equations. 6

   (b) Obtain the expression for Hamiltonian for a relativistic charged particle in an electromagnetic field. 6

UNIT–IV

7. (a) What is Thomson Scattering ? 6

   (b) What are retarded potentials ? Obtain the expression for retarded vector potential. 6

8. (a) Accelerating charged particle emits radiation. Explain. 6

   (b) Daytime clear sky appears blue. Explain the statement with Rayleigh scattering. 6

UNIT–V

9. (a) State the two postulates of STR. 2

(b) Show that four-velocity and four-acceleration vector are orthogonal to each other. 2

(c) What is magnetic mirror ? 2

(d) What is cyclotron frequency ? 2

(e) Construct as many invariants as you can out of electromagnetic tensor $F_{\mu\nu}$. 2

(f) What is :

(i) Contravariant vector

(ii) Covariant vector ?

How do they transform ? 2