(i) Printed Pages : 4] Roll No. .....

(ii) Questions : 9] **Sub. Code : 3716**

Exam. Code : 0474

M.Sc. 3rd Semester Examination

1127

PHYSICS

(Classical Electrodynamics–II)

Paper : PHY-7001

Time : 3 Hours] **[Max. Marks : 60**

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

Unit–I

1. (a) Write a note on Lorentz transformations.

   (b) In a reaction, the initial particles of masses m_1, m_2 transformed to 3 particles m_3, m_4 m_5. $\Delta M = (m_3 + m_4 + m_5) - (m_1 + m_2)$ is positive. Calculate the threshold kinetic energy needed for the reaction to go through, in terms of masses of the particles involved. 6,6

2. (a) An unstable particle of mass M decays into two particles with mass m_1, m_2. ($M > m_1 + m_2$). Using energy momentum invariant principle, obtain the expression for kinetic energy of m_1, in terms of M, m_1, m_2.

(b) Obtain the relativistic equation of motion, counter part of Newton's equation. 6,6

Unit–II

3. (a) Show the trajectory of a charged particle ($v << c$) in uniform constant electric field is parabolic.

(b) Explain the working of magnetic mirror. 6,6

4. (a) Consider the case of a charged particle motion, when magnetic field is constant in time but slowly varying in position. Discuss the motion of the particle.

(b) Discuss the relativistic motion of a charged particle in the field of a plane electromagnetic wave. 6,6

Unit–III

5. (a) Write a note on electromagnetic field tensor. What are its components ? How does it transform under Lorentz transformations ? 4,4

(b) Express continuity equation in covariant form. 4

6. (a) Discuss covariant form of Maxwell equations.

(b) Obtain the equation of motion of a charged particle in an electromagnetic field, proceeding from the principle of least action. 6,6

Unit–IV

7. (a) Obtain Larmor's power formula.

(b) Discuss scattering of a plane wave of monochromatic electromagnetic radiation from a free electron. 6,6

8. (a) Obtain the expression for retarded scalar potential $\phi(\vec{x}t)$.

(b) Discuss scattering of a plane wave of monochromatic electromagnetic radiation from a bound electron. 6,6

Unit–V

(Compulsory Question)

9. (i) State postulates of Special Theory of Relativity (S.T.R.).

(ii) What is time-dilation, length contraction in S.T.R. ?

(iii) How are vector potential and scalar potential related to electric field and magnetic field ?

(iv) What are retarded potentials ?

(v) State Pyonting theorem.

(vi) What is gauge choice in context of Maxwell's equations ? 2 each