

(i) Printed Pages : 3

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(ii) Questions : 9

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Exam. Code :

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M.Sc. Physics 3rd Semester

1128

CLASSICAL ELECTRODYNAMICS-II

Paper-PHY-7001

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) Using the transformation equations of position four vector, obtain the Lorentz transformation equations. 8
- (b) Explain the terms Length contraction and Time dilation. 4
2. (a) Using the concept of energy-momentum invariant, derive expressions for kinetic energies of products when an unstable particle decays into two particles. 6
- (b) Construct the components of four Minkowski force K^μ . 6

UNIT-II

3. (a) Discuss the motion of a charged particle in crossed and uniform electric and magnetic fields. 6
- (b) Explain Gradient drift and derive expression for it. 6

4. (a) Discuss the motion of a relativistically moving charged particle in uniform electric field. 7
- (b) Explain the concept of magnetic mirror. 5

UNIT-III

5. (a) Using the concept of transformation of electromagnetic field tensor, show that electric and magnetic fields have no independent existence as separate entities. 9
- (b) Prove that Maxwell stress tensor is traceless. 3
6. (a) Show that covariant equation of motion of a particle in an em field is :

$$m \frac{du^\mu}{d\tau} = \frac{e}{c} \sum F^{\mu\nu} u_\nu \quad 6$$

- (b) Derive an expression for Hamiltonian of a charged particle in an em field. 6

UNIT-IV

7. (a) Derive an expression for radiated power from an accelerated charge at low velocities. 6
- (b) Discuss Bremsstrahlung in Coulomb collisions. 6
8. (a) A bound electron is acted upon by an em radiation. Derive an expression for differential cross section for scattered radiation. Discuss the cases of weak binding, strong binding and maximum cross section. 8

- (b) Conceptually explain what is Radiation reaction. Why it is assumed to be small ? 4

UNIT-V

9. (a) Prove that four velocity and four acceleration are orthogonal to each other.
- (b) Show that a charged particle in uniform motion radiates no power.
- (c) What is adiabatic approximation ?
- (d) Prove that E.B. is a field invariant.
- (e) Obtain equation of continuity in four vector form.
- (f) Give the postulates of special theory of relativity. 6×2