

M.Sc. Semester-III (CBCS) Examination

PHYSICS

3PHY 1-ELECTRODYNAMICS-II (RADIATION & PLASMA PHYSICS)

Time : Three Hours]

[Maximum Marks : 80

N.B.:—All questions are compulsory and carry equal marks.

1. (a) Obtain wave equation for electric and magnetic fields in free space. 8
- (b) Obtain an expression for Lienard-Wiechert potential of moving point charge and explain its physical significance. 8

OR

- (p) What is synchrotron radiation ? Derive a relation for its radiated power and discuss the directional distribution. 8
- (q) What is radiation reaction ? Discuss about its origin and derive a relation. 8
2. (a) Discuss motion of charged particle in uniform crossed electric and magnetic fields. 8
- (b) Discuss motion of charged particle in magnetic field having direction of gradient perpendicular to magnetic field. 5
- (c) Define first, second and third adiabatic invariants. 3

OR

- (p) Discuss the behavior of a charged particle in slowly time varying magnetic field. 8
- (q) Explain behavior of charged particle in static magnetic field when electric field is zero. 5
- (r) Explain the terms Larmor's radius and guiding center. 3
3. (a) Explain quasi neutrality of plasma and hence deduce an expression for Debye length. 8
- (b) Derive a relation for plasma dielectric constant. 5
- (c) Define plasma. 3

OR

- (p) Derive equation of continuity for plasma. 5
- (q) Deduce the behavior of plasma fluid across magnetic field. 8
- (r) Enlist the uses of plasma. 3
- 4. (a) Derive dispersion relation for electron plasma wave. 8
- (b) Discuss electrostatic electron oscillations and ion waves perpendicular to magnetic field. 8

OR

- (p) What are plasma oscillations ? Deduce an expressions for frequency of plasma oscillations. 8
- (q) Explain propagation of electromagnetic waves through plasma perpendicular to magnetic field with $E_1 \perp B_0$. 8
- 5. (a) What are whistler modes ? Discuss its origin. 6
- (b) Derive the dispersion relation for Alfvén waves and discuss it in detail. 6
- (c) Discuss the simplified model of propagation of radio waves through ionosphere. 4

OR

- (p) Draw CMA diagram and indicate the region in which upper and lower hybrid resonance is located. 6
- (q) Explain cutoffs, for extraordinary wave. 6
- (r) Describe in brief magnetronic waves. 4