AU–381

M.Sc. (Part—II) Semester—III (CBCS) Examination

3PHY1 : PHYSICS

(Electrodynamics—II : Radiation and Plasma Physics)

Time : Three Hours]　　　　　　　　　　　　　　　　　　[Maximum Marks : 80

Note :— All questions are compulsory and carry equal marks.

1. (a) Obtain wave equation for scalar and vector potentials. 8

   (b) Derive Abraham-Lorentz formula for the radiation force by using principle of conservation of energy. 8

OR

   (p) Explain essential conditions for production of Cerenkov radiation. Derive an expression for frequency distribution of the radiated energy. 8

   (q) Derive an electromagnetic field of uniformly moving charge. 8

2. (a) Discuss the motion of a charged particle in an uniform crossed electric and magnetic fields. 8

   (b) Discuss in detail second adiabatic invariant. 6

   (c) What is magnetic mirroring ? 2

OR

   (p) Explain trapping of plasma in magnetic mirror. What is loss cone ? 8

   (q) What is curvature drift and gradient B drift ? 6

   (r) Discuss first and third adiabatic invariants. 2

3. (a) Deduce an equation for fluid drift of plasma perpendicular to magnetic field. 8

   (b) Explain quasi neutrality of plasma. 5

   (c) Explain collective behaviour in plasma. 3

OR

   (p) Discuss behaviour of plasma fluid element parallel to magnetic field. 8

   (q) Deduce and explain the equation of continuity. 3

   (r) Discuss dielectric properties of plasma. 5

4. (a) Derive dispersion relation of electrostatic electron waves perpendicular to magnetic field.

8

(b) Derive dispersion relation for electromagnetic waves propagating through plasma in absence of magnetic field.

8

OR

(p) Derive dispersion relation for electrostatic ion waves.

8

(q) Explain propagation of electromagnetic waves through plasma-parallel to magnetic field.

8

5. (a) Explain Faraday rotation in plasma.

6

(b) Draw CMA diagram and indicate and discuss L & R wave cutoff.

4

(c) Discuss the simplified model of propagation of radio waves through ionosphere.

6

OR

(p) Obtain an expression for velocity of magnetosonic waves in terms of Alfven wave velocity.

8

(q) Show that velocity of Alfven waves linearly depends on magnetic field.

4

(r) Draw CMA diagram and indicate the region in which upper and lower hybrid resonance are located.

4