

M.Sc.(Phy.) Semester - 1 (CBCS) Examination**Oct/Nov. -2019 - [NEW COURSE]****Electrodynamics and Plasma Physics (Core (New))****Time: 2:30 Hours****Marks: 70****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate marks.

1. Answer any seven questions.**14**

- a) What are the different states of matter?
- b) Prove that: electromagnetic wave velocity $v = (\mu_0 \epsilon_0)^{-\frac{1}{2}}$
- c) What are the necessary conditions for production of electromagnetic waves?
- d) Write mathematical expression for gradient of scalar function (ϕ), divergence and curl of a vector function ($\vec{A}$).
- e) Define: Monochromatic plane waves.
- f) Define the operator $\vec{\nabla}$, and laplacian operator ∇^2
- g) Define Plasma instability.
- h) What are the necessary conditions for the production of electromagnetic waves?
- i) Define homogeneous, isotropic and linear media.
- j) Define plasma oscillations.

2. Answer the following questions (Any two)**14**

- a) Derive necessary Maxwell's equations for matter.
- b) Discuss in detail, the concept of skin depth of conduction material.
- c) Derive necessary boundary conditions for normal and tangential components of $\vec{B}$ and $\vec{H}$ at a boundary between two different media.

3. Answer the following questions**14**

- a) Write a note: Lienard – Wiechert potentials.
- b) Derive Faraday's law and Ampere's law in terms of scalar potential (V) and vector potential ($\vec{A}$).

OR

3. Answer the following questions.**14**

- a) Discuss applications of plasma in various fields.
- b) Discuss in detail, the concept of phase velocity (V_p) and group velocity (V_g). How one can characterize? Explain relation between V_p and V_g .

4. Answer the following questions (Any two)**14**

- a) Discuss the statement: "We live in 1% of universe in which plasma does not occur naturally". Write a note on different criteria require for existence of plasma.
- b) What are the techniques for plasma confinement? Discuss any one technique in detail.
- c) Explain the effect of uniform magnetic field ($\vec{B}$) on the motion of charged particles in detail.

5. Write a short note (Any two)**14**

- a) Whistler mode.
- b) Boundary conditions.
- c) Electromagnetic waves in conductors (Skin depth).
- d) Magnetic mirror effect.
