

# C.U.SHAH UNIVERSITY

## Summer Examination-2019

**Subject Name: Electrodynamics and Plasma Physics**

**Subject Code :5SC02EDP1**

**Branch: M.Sc. (Physics)**

**Semester : 2**

**Date : 16/04/2019**

**Time : 02:30 To 05:30**

**Marks: 70**

**Instructions:**

- (1) Use of Programmable calculator and any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

### SECTION – I

- Q-1      Attempt the Following questions.      (07)**
- a. Write Modified Ampere's Law. (01)
  - b. Write Maxwellian equations for the EM waves in Vacuum or insulator. (01)
  - c. What is Co-axial transmission line? (01)
  - d. Write Maxwell's equations inside the Polarized Matter. (01)
  - e. What is D'Alembertian Operator? Write its general formula. (01)
  - f. What is the Retarded Potential? (01)
  - g. Write the final formula equations for 'Lienard-Wiechert Potentials'. (01)
- Q-2      Attempt all questions      (14)**
- A Derive Maxwell's Equations in matter. (05)
  - B Derive the Maxwellian expressions for the electromagnetic waves in (09)
    - (i) Vacuum
    - (ii) conducting material (Absorption and Dispersion)
- OR**
- Q-2      Attempt all questions      (14)**
- A Derive necessary expression for the EM waves in Skin-Depth of the (09) conductor. Discuss the cases for Good- and Poor- conductors.
  - B Apply boundary conditions to Maxwell's equations and derive necessary (05) formulas.
- Q-3      Attempt all questions      (14)**
- A Narrate reflection and transmission of electromagnetic waves in matter at (07) any one incidence – Normal incidence or Oblique incidence.
  - B What is a wave guide? Discuss: Waves in a rectangular wave guide. (07)
- OR**



- Q-3 Attempt all questions (14)**
- A** What is Vector potential and Scalar potential? Obtain the general solution of Maxwell's equations in terms of scalar and vector potentials. (07)
- B** Define Gauge Transformation. Express Gauge Transformations deriving necessary formulas. (07)

**SECTION – II**

- Q-4 Attempt the Following questions. (07)**
- a.** Why can plasma be treated as a fluid? (01)
- b.** What is the 'Dielectric Dyad'? Write its formula. (01)
- c.** What replacements are done for the linearization process of wave equation in the terms of time derivative  $\left(\frac{\partial}{\partial t}\right)$  and gradient  $\nabla$  ? (01)
- d.** Define: Plasma collisions. (01)
- e.** What is group velocity? Write its formula in terms of plasma. (01)
- f.** What is phase velocity? Write its formula in terms of plasma. (01)
- g.** What do you know about the plasma parameter  $\lambda$ ? (01)

- Q-5 Attempt all questions (14)**
- A** Write a detailed note on properties of plasma. (07)
- B** Describe : Applications of plasma. (07)

**OR**

- Q-5 Attempt all questions (14)**
- A** Describe the plasma dielectric constant. (05)
- B** Derive the fluid equation of motion in terms of plasma. (09)

- Q-6 Attempt all questions (14)**
- A** Discuss the Fluids drifts of plasma parallel and perpendicular to the Magnetic field **B**. (11)
- B** Write Jefimenco equations. What is their importance? (03)

**OR**

- Q-6 Attempt all Questions (14)**
- A** What are the Ion Acoustic Waves? Discuss and derive necessary formulas for angular and sound velocity for the ion acoustic waves. (07)
- B** Check the validity of the Plasma Approximation. (07)

