C.U.SHAH UNIVERSITY
Summer Examination-2018

Subject Name : Electrodynamics and Plasma Physics

Subject Code : 5SC02EDP1   **Branch: M.Sc. (Physics)**

Semester : 2   **Date :23/04/2018**   **Time : 10:30 To 01:30**   **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 a complete set of Maxwell's equations in matter in terms of electrodynamics.	**01**
b.	Write the modified Ampere's law identifying each term with unit.	**01**
c.	Write electromagnetic wave equations of electric field, magnetic field and wave number for the conducting materials in case of absorption and dispersion.	**01**
d.	Give the necessary conditions for the production of electromagnetic waves.	**01**
e.	Define wave guide.	**01**
f.	Define retarded potential.	**01**
g.	Define scalar and vector potential giving formula with units in terms of electrodynamics.	**01**

Q-2	**Attempt all questions**	**(14)**
A	Derive expressions for general boundary conditions in electrodynamics. Explain Maxwell's general boundary conditions in case of linear medium.	**07**
B	Derive the ElectroMagnetic wave equations in conducting materials for absorption and dispersion.	**07**

OR

Q-2	**Attempt all questions**	**(14)**
A	What is dipole formalism by polarisation? Obtain MaxWell's equations inside the Polarized Matter.	**07**
B	Narrate reflection and transmission of electromagnetic waves in matter for any one case: either at the Normal incidence or at the Oblique incidence.	**07**

Q-3		**Attempt all questions**	**(14)**
	A	Define and discuss Gauge Transformation deriving necessary formulas.	**07**
	B	Describe Coulomb Gauge and Lorentz Gauge with necessary equations for scalar and vector potentials in D'Alembertian equation forms. Compare Coulomb Gauge and Lorentz Gauge.	**07**

OR

Q-3	**A**	Discuss : Point Charge and Lienard~Wiechert potential.	**07**
	B	Narrate Electric and Magnetic fields of a moving point charge and derive equations for the same.	**07**

SECTION – II

Q-4		**Attempt the Following questions**	**(07)**
	a.	What is plasma? Define : plasma as fluid.	**01**
	b.	What are the properties of plasma?	**01**
	c.	Give plasma parameters.	**01**
	d.	Write complete set of fluid equations of motion of plasma. Identify each terms with unit.	**01**
	e.	Write formula for the plasma phase velocity. Identify each terms.	**01**
	f.	Write formula for the plasma group velocity. Identify each terms.	**01**
	g.	What can you say about the relation between electron plasma waves and Ion waves showing their graphs?	**01**

Q-5		**Attempt all questions**	**(14)**
	A	Write a brief note on : Plasma Criteria.	**04**
	B	Write a brief note on : Collisions in plasma	**05**
	C	What is Debye shielding? Derive necessary formula.	**05**

OR

Q-5	**A**	Discuss : Classical treatment of magnetic materials and dielectrics on plasma.	**07**
	B	Derive formula for the low frequency plasma dielectric constant for transverse mode. Calculate its value.	**07**

Q-6	**A**	**Attempt all questions**	**(14)**
	B	Discuss and derive the plasma fluid equation of motion.	**07**
		Derive expressions : (i) Plasma drifts perpendicular to magnetic field and (ii)Plasma drifts parallel to magnetic field	**07**

OR

Q-6	**A**	**Attempt all Questions**	**07**
	B	Derive a generalized formula for the plasma oscillations.	**07**
		Discuss and derive electrostatic electrons oscillations perpendicular to magnetic field in plasma	