Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2021

Course: Electrodynamics **Semester: I**
Course Code: PHYS7005 **Max. Marks: 100**
Programme: M. Sc. (Physics) **Total pages: 2**
Time: 03 hrs.

Instructions:

- All questions are compulsory (**Q9** and **Q11** have an internal choice)
- Scientific calculators can be used for calculations.

SECTION-A

S. No.		Marks	CO
Q1.	Write down the Poisson and Laplace equation in 3-dimension.	**4**	**CO1**
Q2.	Express the point $P\ (1, 1, 3)$ in spherical coordinates.	**4**	**CO2**
Q3.	If the radius of the Sun is 7×10^8 m and power radiated by it is 3.8×10^{26} Watts. Calulate the magnitude of Poynting vector at the surface of the Sun.	**4**	**CO3**
Q4.	Five thousand electric lines of forces enter a volume and three thousands leave it. Find the total charge contained in it.	**4**	**CO1**
Q5.	Define Pinch effect in Plasma.	**4**	**CO4**

SECTION-B (Question No: 9 has an internal choice)

Q6.	Explain the term retarded potentials. Obtain the expression for the EM field of a moving point charge in space.	**10**	**CO1**
Q7.	Define Plasma oscillations, calculate the expression for Plasma oscillation frequency.	**10**	**CO4**
Q8.	Discuss the reflection and refrection of EM wave from non conducting media, obtain all the relevant formulae mathematically.	**10**	**CO2**
Q9.	A wire bent as a parabola $y=ax^2$ is located in a uniform magnetic field of induction B, perpendicular to (x,y) plane. At the moment t = 0, a connecting bar MN starts sliding translation wise from the apex of parabola with constant acceleration f. Find the EMF induced in the loop thus formed as a function of y. **OR**	**10**	**CO2**

	A dielectric slab of flat surface with relative permittivity 3 is disposed to a uniform field with its surface normal to the field. The slab has a flux density of 1.5 C/m^2 and occupies a volume of 0.8 m^3 and uniformly polarized. Determine (i) the polarization in slab and (ii) the total dipole moment of the slab.		
SECTION-C (Question No: 11 has an internal choice)			
Q10.	(a) Show that the charge is relativistically invariant, while the charge density is not. (10M) (b) Obtain the relativistic form of Newton's second law, when force (F) is parallel to velocity (v). (5M) (c) Define Poynting theorem. (5M)	**20**	**CO3**
Q11.	Obtain Magnetohydrodynamics equations for Plasma. **OR** Define Debye shielding and quasi-neutrality in plasma. Obtain the expression for Debye length.	**20**	**CO4**