Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: M Sc Physics **Semester : I**

Program: Electrodynamics **Time : 03 hrs.**

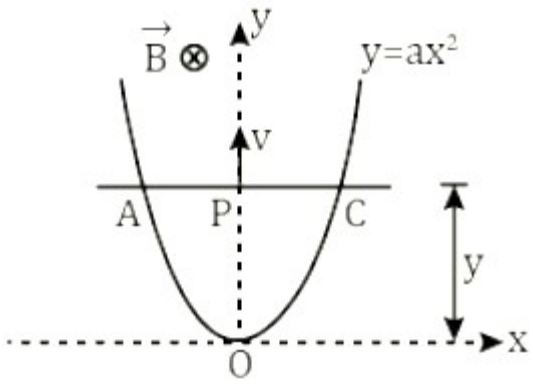
Course Code: PHYS7005 **Max. Marks: 100**

Instructions: Read all the below mentioned instructions carefully and follow them strictly:

- Mention Roll No. at the top of the question paper.
- Attempt all the parts of a question at one place only

SECTION A (5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Explain the Ampere circuital theorem	**4**	**CO2**
Q 2	Drive the expression for time dilation	**4**	**CO2**
Q 3	Write the Maxwell's equations for static fields in phasor form	**4**	**CO1**
Q 4	If radius of the Sun is $7\,X\,10^{8}$m and power radiated by it is $3.8\ X\ 10^{26}$Watts, calculate the magnitude of the Poynting vector at the surface of the Sun.	**4**	**CO1**
Q 5	Explain the Behavior of fluid in electromagnetic fields	**4**	**CO1**
SECTION B (4Qx10M= 40 Marks)			
Q 6	Derive reflectance in oblique incidence for linear dielectric media	**10**	**CO3**
Q 7	Obtain the Helmholtz wave equation and its solutions for dielectric medium in terms of a. Refractive index of the material b. Velocity of the particle	**10**	**CO2**
Q 8	State the Poynting theorem and derive the expression for Poynting vector and write its significance	**10**	**CO3**
Q 9	Explain the Physical basis of radiation reaction in detail **OR** Two spaceships approach each other, each moving at the same speed as measured by a stationary observer on the Earth. Their relative speed is 0.70c, Determine the velocities of each spaceship as measured by the stationary observer on Earth.	**10**	**CO1**

SECTION C (2Qx20M=40 Marks)			
Q 10	a. Derive the expression for relativistic addition of velocities and discuss its significance. b. 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 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.  	**12** **8**	**CO4** **CO3**
Q 11	a. State Einstein's postulates and the expressions for Lorentz transformations b. The free neutron is known to decay into a proton, an electron and an antineutrino (of zero rest mass) This is called beta decay. The decay products are measured to have a total kinetic energy of (0.781 ± 0.005) MeV. Show that this observation is consistent with the Einstein mass-energy relationship. Mass of Proton: $938.2723\ MeV/c^2$, Electron: $0.5110\ MeV/c^2$, Neutron: $939.5656\ MeV/c^2$ **OR** a. Define Retarded potentials and obtain the expression for Jefimenkos equations b. Derive an expression for Einstein's energy mass equivalence.	**12** **8** **12** **8**	**CO4** **CO2** **CO4** **CO2**