

Name:  
Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2022**

**Course: M Sc Physics**  
**Program: Electrodynamics**  
**Course Code: PHYS7005**

**Semester : I**  
**Time : 03 hrs.**  
**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	Find the gradient of the scalar fields: $U = \rho^2 Z \cos 2 \varphi$	4	CO2
Q 2	Drive the expression for Time dilation	4	CO2
Q 3	Write the Maxwell's equations for static fields	4	CO1
Q 4	Explain the Ampere circuital theorem	4	CO1
Q 5	Explain the Behavior of fluid in electromagnetic fields	4	CO1

**SECTION B**  
**(4Qx10M= 40 Marks)**

Q 6	Derive reflection and transmission 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 explain its significance	10	CO3
Q 9	Explain the Physical basis of radiation reaction in detail	10	CO1

**SECTION C**  
**(2Qx20M=40 Marks)**

Q 10	a. Derive the expression for relativistic addition of velocity and discuss the significance.	12	CO4
		8	

	b. At what speed must an observer move past the earth so that earth appears like an ellipse whose major axis is six times the minor axis?		<b>CO3</b>
Q 11	<p>a. State Einstein's postulates and the expressions for Lorentz transformations</p> <p>b. Calculate relativistic momentum in units of MeV/c of electron having kinetic energy of 500 keV.</p> <p>Or</p> <p>a. Define Retarded potentials and obtain the expression for Jefimenkos equations</p> <p>b. Discuss the concept of plasma and obtain an expression for plasma frequency.</p>	<p><b>12</b></p> <p><b>8</b></p>	<p><b>CO4</b></p> <p><b>CO2</b></p>