

Name: 2

Enrolment No:



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

Program Name: B.Sc. (H) Geology, Chemistry & Mathematics

Course Name: Electricity and Magnetism

Course Code: PHYS 1016G

Time: 03 hrs.

Semester: I

Max. Marks: 100

Nos. of pages: 2

Instructions: Answers should be brief and concise.

SECTION A (20 marks)

All question of section A are compulsory

S. No.		Marks	CO
Q 1	What do you mean by electric dipole and electric dipole moment?	4	CO1
Q2	Potential of a certain charge configuration is expressed by $V=5x+5xy+y$ volts. Find the Electric field intensity at point (5,3).	4	CO2
Q3	If $\vec{A} = 2\hat{i} + 3\hat{j} + \hat{k}$, $\vec{B} = \text{and } \hat{i} + 3\hat{j} + 2\hat{k}$ Find the angle between two vectors.	4	CO2
Q4	The self-inductance of a coil having 200 turns is 40 mH, calculate the magnetic flux through the cross-section of the coil corresponding to a current of 4 mA. Calculate the total flux linked with the coil.	4	CO3
Q5	Define and write the mathematical form of Biot Savart's Law.	4	CO1

SECTION B (40 marks)

Question 9 consists of an internal choice

Q 6	What do you mean by a gradient of scalar field? Derive the relation that represents its physical significance.	10	CO1
Q 7	Prove that the Gradient of electrical potential due to point charge "q" represents the electric field at any point.	10	CO4
Q 8	What is electromagnetic induction? Give a brief account of the experiment to demonstrate it. State the concept of self and mutual inductance.	10	CO2
Q 9	Derive the relation for magnetic field on the axis of current carrying circular coil by using Biot – Savart Law. OR By using Ampere's Law, derive the relation for the magnetic field due to an infinitely long solenoid.	10 10	CO2 CO2

SECTION-C (40 marks)
(Q10 is compulsory. Attempt any set of Q11 & 12)

Q 10	a) Derive and discuss the equation of continuity $\vec{\nabla} \cdot \vec{J} = \frac{\partial \rho}{\partial t}$. Derive its form for a steady current. b) Explain the importance of each maxwell equation and write its differential and integral form for free space.	10	CO4
Q 11	a) Derive the Electric field due to non -conducting charged sheet of surface charge density “ σ ”. b) By using Gauss's law, derive electric field intensity due to the spherical shell at a point inside, outside, or on the surface of a spherical shell.	10	CO3
OR			
Q 12	c) Derive electric potential due to an electric dipole at its equatorial and axial point. d) Derive the expression for the electric potential at a point inside, outside or on the surface of solid sphere.	10	CO3
		10	CO3