UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Program Name: B.Sc. (H) Geology, Chemistry & Mathematics; Int B.Sc & M.Sc (Mathematics)
Course Name: Electricity and Magnetism   **Semester: I**
Course Code: PHYS 1016   **Max. Marks: 100**
Time: 03 hrs.   **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	Potential of a certain charge configuration is expressed by $V=4x+2xy+y$ volts. Find the Electric field intensity at point (3,2).	4	CO2
Q2	For a position vector $\vec{r} = 6x\hat{\imath} + 7y\hat{\jmath} + 2z\hat{k}$, Calculate div $\vec{r}$	4	CO2
Q3	What do you mean by polar and non-polar molecules?	4	CO1
Q4	Magnetic flux through a circular loop is given by $0.04\ t^3$ Wb. What is the induced e.m.f. in the loop at t = 1 sec.	4	CO2
Q5	What do you mean displacement current and write its mathematical form in terms of electric field.	4	CO1

SECTION B (40 marks)
Question 9 consist of an internal choice

Q 6	State and prove Gauss' law for electrostatic. Derive the differential form of Gauss's law in electrostatic.	10	CO3
Q 7	Write down Maxwell's equations in differential and integral forms for time varying fields and write their physical significance.	10	CO4
Q 8	Derive continuity equation of current and by introducing the concept of displacement current, establish the Maxwell's fourth equation for time varying field.	10	CO4
Q 9	State and prove the reciprocity theorem for the phenomenon of mutual induction **OR** State Faraday's and Lenz's law of electromagnetic induction. Prove that Lenz's law is a consequence of the principle of conservation of energy.	10	CO3

SECTION-C (40 marks) **(Q10 is compulsory. Attempt any set of Q11 & 12)**			
Q 10	A) State the Bio - Savart Law. By using Biot – Savart Law, derive the relation for magnetic field on the axis of current carrying circular coil.	**10**	**CO3**
	B) State and prove Ampere's Circuital Law and derive the differential form of Ampere's Law.	**10**	**CO3**
Q 11	A) Calculate the electric field due to charged solid sphere at a point inside and outside of solid sphere.	**10**	**CO3**
	B) What do you mean by curl of Vector field? Derive the relation that represent its physical significance. **OR**	**10**	**CO3**
Q 12	A) Derive the relation to explain the effect of dielectric material on the capacitance of capacitor.	**10**	**CO3**
	B) What do you mean by divergence of Vector field? Derive the relation that represent its physical significance.	**10**	**CO3**