Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Program Name: B.Sc. (H) Chemistry & Mathematics **Semester: I**
Course Name: Electricity and Magnetism **Time: 03 hrs.**
Course Code: PHYS 1016 **Max. Marks: 100**
Nos. of pages: 2

Instructions: 1) Mention Roll No at the appropriate place in the question paper.
2) Answers should be brief and concise.

SECTION A (20 marks)
All question of section A are compulsory

S. No.		Marks	CO
Q 1	For a position vector $\vec{r} = 2x\hat{\imath} + 3y\hat{\jmath} + 4z\hat{k}$, Calculate div $\vec{r}$	**4**	**CO1**
Q2	If the electric field is given by $\vec{E} = 3\hat{\imath} + 4\hat{\jmath} + 8\hat{k}$, Calculate the electric flux through a surface of area 200 units lying in the y-z plane.	**4**	**CO1**
Q3	What do you mean by magnetic field intensity? What is its unit?	**4**	**CO2**
Q4	Define displacement current and write modified form of Ampere's Law.	**4**	**CO4**
Q5	The self-inductance of a coil having 400 turns is 80 mH, calculate the magnetic flux through the cross-section of the coil corresponding to current of 4 mA. Calculate total flux linked with coil.	**4**	**CO3**
	SECTION B (40 marks) **Question 9 consist of an internal choice**		
Q 6	What do you mean by curl of Vector field? Discuss its physical significance.	**10**	**CO1**
Q 7	Calculate the electric potential due to charged solid sphere at a point inside and outside of charged solid sphere.	**10**	**CO1**
Q 8	What is the physical significance of equation of Continuity and deduce the relation for it. What is the form of equation of continuity for steady current?	**10**	**CO4**
Q 9	Define the phenomenon of self-induction and co-efficient of self-induction. What is unit of coefficient of self-induction? Derive the expression for co-efficient of self-induction for current loop of radius "r". **OR** State and explain the Faraday's law of electromagnetic induction. Find the magnitude of e.m.f. induced in a 200 turns coil with cross sectional area of 0.16 m^2 if the magnetic field through the coil changes from 0.10 to 0.50 Wbm^{-2} at a uniform rate over a period of 0.01 seconds.	**10**	**CO3**

SECTION-C (40 marks) (Q10 is compulsory. Attempt any set of Q11 & 12)			
Q 10	a) What do you mean by equipotential surface? Write its properties. Calculate the work done in carrying a test charge from one point to the other on the equipotential surface?	**10**	**CO1**
	b) Write down Maxwell's equations and their physical significance in their differential and integral forms for both static and time varying fields.	**10**	**CO4**
Q 11	a) State the Bio - Savart Law. By using Biot–Savart Law, derive the magnetic field due to straight current carrying conductor.	**10**	**CO2**
	b) State and prove Ampere's Circuital Law. By using Ampere's Law, find the out the magnetic field due to current carrying hollow cylinder of radius "a"; inside and outside the cylinder.	**10**	**CO2**
	OR		
Q 12	a) Derive the relation for magnetic field on the axis of current carrying circular coil by using Biot – Savart Law.	**10**	**CO2**
	b) What is solenoid? Calculate the magnetic field due to solenoid. Discuss the case when observation point lies in the middle and at one end of infinite length solenoid.	**10**	**CO2**