UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Term Examination, January 2021

Course: Electricity & Magnetism   **Semester: I**
Program: B.Sc H (Physics, Chemistry & Geology)   **Time 03 hrs.**
Course Code: PHYS1016   **Max. Marks: 100**

SECTION A

1. **Each Question will carry 5 Marks**
2. **Instruction: Complete the statement / Select/write the correct answer(s)**

S. No.	Question	Marks	CO

Q 1	A) Statement given ""Line integral of any vector field around any closed curve C is equal to the surface integral of the curl of the vector field over an open surface S enclosed by the curve C"" is "
	    i) Gauss divergence Theorem
	    ii) Stokes Theorem
	    iii) Gauss Law
	
	B) Vector of magnitude of 5 units making an angle 60° with the x-axis. Find its components along x-axis.
	    i) 2.5 units ii) 5 units iii)10 units iv) 0 units
		2.5
		
		2.5
			CO1

Q2	A) What do you mean by Electric dipole moment and write its SI units. B) Electric field due to charged hollow sphere inside is i) finite ii) infinity iii) zero	3 2	CO1

Q3	A) Magnetic field outside the infinite solenoid is
	    i) Infinite ii) Zero iii) $\mu_0 nI$
	
	B) The magnetic field (in T) at the center of coil of radius 25 cm and having 5 turns and current of 5A flow through it, is
	    i) 0.628×10^{-4} ii) 1 iii) 0 iv) ∞
		2.5
		
		2.5
			CO2

Q4	A) What is a magnetic flux? Write its units B) If a magnet is moved towards the coil with different speed, then induced e.m.f. is i) Same for any speed ii) Larger if moves slowly iii) Smaller if moves slowly iv) Smaller if moves faster	3 2	CO3
Q5	A) Write two basic statements derived on the basis of Faraday's experiment. B) The self-inductance of a coil having 200 turns is 40 mH. Calculate the magnetic flux (in Wb) through the cross-section of the coil corresponding to current of 4 mA. i) 16×10^{-5} ii) 18×10^{-7} iii) 0 iv) infinite	3 2	CO3

Q6	A)What do you mean by displacement current?	2	CO4
	B) Write any three properties of Electromagnetic Waves?	3	

SECTION B			
1. **Each question will carry 10 marks**			
2. **Instruction: Write short / brief notes**			

Q 7	State the Biot-Savart Law**.** By using Biot Savart's Law, derive the expression for magnetic field due to straight current carrying conductor.	10	CO2
Q 8	Define and derive the Ampere's circuital law. By using the Ampere's Law, calculate the Magnetic field due to infinite long solenoid.	10	CO2
Q 9	Derive the equation of Continuity and write its physical significance.What is the form of equation of continuity for steady current?	10	CO4
Q 10	Write down Maxwell's equations in their differential and integral forms for both static and time varying fields and write their physical significance.	10	CO4
Q 11	Define the phenomenon of mutual induction and derive the reciprocity theorem. **Or** Derive the differential and integral form of Faraday's law of electromagnetic induction.	10	CO3

Section C			
1. **Each Question carries 20 Marks**			
2. **Instruction: Write Long answer**			

Q 12	A) What do you mean by divergence of Vector field? Derive the relation that explain its physical significance. B) Calculate the electric potential due to electric dipole on its axial and equatorial point. **Or** A) What do you mean by Curl of a vector field? Derive the relation that explain its physical significance. B) Calculate the electric field due to charged solid sphere at a point inside and outside of a charged solid sphere.	20	CO1