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321202

May 2026

B.Sc. (PHYSICS) II SEMESTER

Electricity & Magnetism (PHU–106V)

Time : 3 Hours] [Maximum Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any **four** questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define electric field in terms of gradient. (1.5)
   (b) Define ideal electric dipole moment. (1.5)
   (c) Write differential form of Gauss's law. (1.5)
   (d) Define displacement vector D. (1.5)
   (e) Define dielectric constant. (1.5)
   (f) Define polarization. (1.5)
   (g) Define magnetic vector potential. (1.5)
   (h) Define intensity of magnetization. (1.5)

(i) Define Bohr's magnetrons and also writes its value. (1.5)

(j) Define coefficient of self inductance. (1.5)

PART–B

2. (a) State and prove Gauss's law integral and differential form. (10)

(b) Explain any one application of Gauss's theorem. (5)

3. (a) State and prove Laplace's and Poisson equation. (10)

(b) Consider a parallel plate capacitor of each plate area a^2 and they are separated by a distance 'a' one plate is at $x = 0$ distance, is grounded and other plate is at $2\ V_0$. What is the potential V(x) of the capacitor? (5)

4. State and prove Biot-Savart law. Derive the expression of magnetic field due to a infinite long state conductor carrying current with special cases. (15)

5. (a) Write all properties of diamagnetism, paramagnetic and Ferromagnetism materials. (10)

(b) Establish the relation between magnetic permeability and magnetic susceptibility. (5)

6. (a) State and prove Faraday law of electromagnetic induction. Derive the expression coefficient of self inductance of a single coil. (10)

(b) The magnetic flux through a coil perpendicular to its plane and directed into paper is varying according to the relation :

$$\theta = \left(5t^2 + 10t + 5\right)$$

miliweber. Calculate the e.m.f. induced in the loop at $t = 5$ seconds. (5)

7. Write short notes on the following:

(a) Vector potential.

(b) Boundary Condition.

(c) Energy stored in a magnetic field. (15)