

[This question paper contains 4 printed pages.]

1914

Your Roll No.

B.Sc. Prog. / II

E

PH-201 – PHYSICS

(Electricity, Magnetism and Electromagnetic Theory)

Time : 3 Hours

Maximum Marks : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Attempt five questions in all.

Question No. 1 is compulsory.

All questions carry equal marks.

1. Attempt any five of the following :

(a) State and explain Stoke's Theorem.

(b) Establish the relation $E = -\nabla V$

(c) Define numerical aperture, critical angle and acceptance angle in optical fibres.

(d) Obtain an expression for energy density in a magnetic field.

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- (e) Prove that the work done in moving a charge from one point to the other in an electrostatic field is path independent.
- (f) What are the conditions for a moving coil galvanometer to be ballistic?
- (g) What do you understand by polarization of electromagnetic waves? Discuss circular polarization. (3×5=15)
2. (a) Explain the physical significance of curl of a vector. (5)
- (b) Evaluate :
- $$\mathbf{A} \times (\mathbf{B} \times \mathbf{C}) + \mathbf{B} \times (\mathbf{C} \times \mathbf{A}) + \mathbf{C} \times (\mathbf{A} \times \mathbf{B})$$
- (10)
3. (a) State and prove Gauss's flux law in electrostatics. Obtain its differential form. (10)
- (b) Obtain an expression for the electric field intensity E at a point inside a uniformly charged non conducting solid sphere. (5)
4. (a) Show that the tangential components of E and normal components of D have the same value on each side of the boundary surface separating two different dielectric media.

- (b) If a dielectric completely fills the space between the plates of a parallel plate capacitor, show that the induced charge varies with the dielectric constant as

$$q' = q \left(1 - \frac{1}{K} \right)$$

where the symbols have their usual meaning.

(10,5)

5. (a) State and explain Biot-Savart's law. (5)
- (b) Obtain an expression for the magnetic flux density at a point due to an infinitely long straight current carrying conductor. (10)
6. (a) State and explain Faraday's laws of electromagnetic induction with the help of illustrative experiments. (10)
- (b) A long solenoid of length L , cross-section A , having N_1 turns has another short coil of N_2 turns wound around its centre. Find an expression for the mutual inductance of the system. (5)
7. (a) What are electromagnetic waves? Show that they are transverse in nature. (10)

- (b) Show that electromagnetic waves travel in free space with the speed of light. (5)
8. (a) Draw Wien's Bridge and obtain its balance condition. (10)
- (b) State and explain Thevenin's Theorem. (5)