

This question paper contains 4 printed pages.]

3825

Your Roll No.

B.Sc. Prog. / II

IS

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.

1. Attempt any five :

- (a) Discuss circular polarization of em waves.
- (b) State Stoke's theorem and divergence theorem.
- (c) State Gauss's law in electrostatics. Express it in integral form.
- (d) Give a relation between Electric field and Electric potential.

[P.T.O.]

- (e) Do magnetic monopoles exist ? Discuss and justify your answer.
- (f) Obtain an expression for Torque on a current loop in a uniform magnetic field.
- (g) Define numerical aperture, critical angle and acceptance angles in optical fibres.

3×5

2. (a) Prove that $\text{Curl Grad } \phi = 0$

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- (b) Prove that $\nabla^2 \left(\frac{1}{r} \right) = 0$

5

- (c) Find the directional derivative of $\phi = x^2yz + 4xz^2$ at $(+1, -2, -1)$ in the direction $(2\hat{i} - \hat{j} - 2\hat{k})$.

5

3. (a) Define the term \vec{D} , \vec{E} and \vec{P} . Establish a relationship between them.

4

- (b) Obtain Gauss's law in dielectrics.

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- (c) Find an expression for potential energy of a system of charges.

6

4. (a) Using Ampere's law find an expression for magnetic field due to a straight current carrying conductor.

5

- (b) Prove that $\text{Curl } \vec{B} = \mu_0 \vec{J}$

5

- (c) Calculate the magnetic induction \vec{B} at a point P at a distance 2 m on the axis of a circular coil of radius 1 mm carrying a current of 0.5 Amp.

5

5. (a) State Faraday's Laws of electromagnetic induction.

Prove that $\text{Curl } \vec{E} = -\frac{\partial \vec{B}}{\partial t}$

5

- (b) Find an expression for the self-inductance of a solenoid.

5

- (c) A uniform magnetic field of $40 \times 10^{-4} \text{ Wb/m}^2$ is applied perpendicular to the plane of a coil of radius 0.02 m and of 500 turns. If the magnetic field is reversed in 0.01 second, calculate the average e.m.f. in coil.

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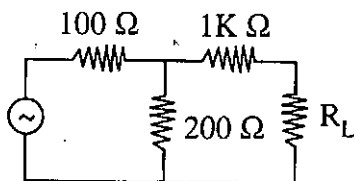
6. (a) Starting from the Maxwell's equations in vacuum, derive the wave equation. Prove the transverse nature of Electromagnetic waves.

10

- (b) State Poynting Theorem and explain what you understand by the Poynting vector.

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7. (a) State Norton's Theorem and draw the equivalent circuit for the given network :

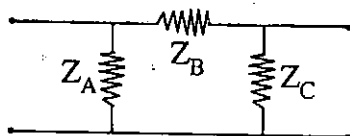


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- (b) Derive the balance condition for an Anderson's Bridge.

5

- (c) Convert a given π -network into T-network.



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