Progressive Education Society's
Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16
(Autonomous)
End Semester Examination: OCT / NOV 2024
Faculty: Science and Technology

Program: B.Sc. Code (Gen03) **Semester: V** **SET: A**
Program (Specific): General B.Sc. **Course Type: Core course**
Class: T.Y.BSc (Gen) **Max.Marks: 35**
Name of the Course: Electrodynamics
Course Code: 24-PHY-352 **Time: 2Hr**
Paper: II

Instructions to the candidate:

1) *There are four sections in the question paper. Write each section on separate pages.*
2) *All Sections are compulsory.*
3) *Figures to the right indicate full marks.*
4) *Draw a neat, labelled diagram wherever necessary.*

SECTION: A

Q1) Answer the following: **5**

i) Define the term 'current density'. Give its S.I unit.
ii) What is meant by electric potential at a point?
iii) Write equation of continuity in magnetostatics.
iv) State Faraday's law in electromagnetic induction.
v) State Ampere's circuital law.

Q2) Answer the following (Any four): **4**

i) Give the physical interpretation of 'poynting vector $(\vec{P})$'.
ii) What is polar molecule?
iii) What is dielectric material?
iv) Write limitations of Coulomb's law.
v) Give S.I unit of electric field.
vi) Write integral form of Gauss's law.

SECTION: B

Q3) Answer the following (Any four): **8**

i) Define electric displacement vector $\vec{D}$. Give its S.I. unit.

ii) Define dielectric constant. Give its S.I unit.

iii) What is diamagnetism?

iv) Find the potential at the center of square of side 1m and have charges q, 2q, -3q, 4q at its corner. ($q = 1 \times 10^{-9}$ C, $1/4\pi\varepsilon_\circ = 9 \times 10^9$ Nm^2/C^2).

v) Given an electric field $E = E_o \sin B_z \cos\omega t \, \widehat{a_z}$ in free space. Determine the corresponding charge density.

vi) What do you mean by uniform plane electromagnetic wave?

SECTION: C

Q4) Answer the following (Any two): 8

i) Two speres of charges +20 and +80 coulomb are placed 18 cm apart. Find the position of the point between them where the intensity is zero. ($1/4\pi\varepsilon_\circ = 9 \times 10^9$ Nm^2/C^2)

ii) Using Biot- Savart's law, derive an expression for magnetic induction due to a straight conductor, carrying current I, at a point near the conductor.

iii) Show that $\vec{\nabla} \times \vec{E} = -\dfrac{\partial \vec{B}}{\partial t}$

iv) Two long, parallel wires, separated by 3.5 am in air carry currents of 0.8 A and 2.5 A in the same direction. Find the force per unit length of the wire. Also comment on nature of force.

SECTION: D

Q5) Answer the following (Any two): 10

i) Define potential energy of a system of charges and obtain an expression for the potential energy of a system of charges.

ii) Obtain the relation between $\vec{D}$, $\vec{E}$ and $\vec{P}$ and hence explain the physical significance of three vectors.

iii) Point charges +q and -2q are kept near an infinite grounded conducting plane at a perpendicular distance '2d' and 'd' respectively form it, find the total force on the charge +q.

iv) Give integral and differential form of Maxwell's equation and explain their physical significance.

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