

2041
B.A./B.Sc. (General) First Semester
Physics
Paper – C: Electricity and Magnetism - I

Time allowed: 3 Hours

Max. Marks: 44

NOTE: Attempt *five* questions in all, including Question No. VII (Unit-III) which is compulsory and selecting two questions each from Unit I - II. Use of non- programmable calculator and log tables are allowed.

x-x-x

UNIT – I

- I. a) Derive an expression for electric field due to electric dipole at a point on its axial line.
b) Define curl of a vector field and find out curl of vector \vec{A} , where

$$\vec{A} = 6xy\hat{i} + (3x^2 + 3y^2)\hat{j} \quad (6,3)$$

- II. a) State and prove Gauss's Divergence theorem.
b) A charge $q_1 = 400 \mu\text{C}$ exerts force $(60\hat{i} - 80\hat{j})$ N on an unknown charge q_2 in vacuum separated by distance of 30m. Find the charge q_2 . (6,3)

- III. a) State and prove Stoke's theorem.
b) Find out electric field \vec{E} due to a uniformly charged thin ring of radius 'a' at a point on its axis at a distance 'z' from the center. (6,3)

UNIT - II

- IV. What is electric dipole? Derive an expression for the potential V due to an electric dipole of dipole moment \vec{P} and locate at the origin. How does potential vary with distance. (9)
- V. a) From the differential form of Gauss's law, develop the Poisson's and Laplace's equation.
b) The electric potential at any point in x - y plane is given by $V = -bxy$ where b is constant. Find the electric field at a distance r from the origin. (6,3)

P.T.O.

(2)

- VI. a) What is atomic polarisability? Find a relation between dipole moment and atomic polarisability.
- b) Derive a relation between dielectric constant and susceptibility. (6,3)

UNIT - III

VII. Attempt any eight of the following:-

- a) Show that electric field conservative and $\text{Curl } \vec{E} = 0$.
- b) Define Coulomb and stat Coulomb.
- c) Define electric field intensity.
- d) In a region an electric field is $E = 2\hat{i} + 3\hat{j} + \hat{k}$. Calculate electric flux through the surface $\vec{S} = 10\hat{i}$.
- e) What is an equipotential surface?
- f) Electric field in a certain region of space is zero. Should the electric potential be also zero?
- g) What is electric quadrupole?
- h) What are non-Polar molecules?
- i) What are dimensions of atomic polarisability?
- j) What is displacement vector. (8x1)

x-x-x