(i) Printed Pages : 3] Roll No. .....

(ii) Questions : 7] **Sub. Code :** 0 0 4 8

Exam. Code : 0 0 0 1

B.A./B.Sc. (General) 1st Semester Examination

1127

PHYSICS

(Electricity and Magnetism–I)

Paper : C

Time : 3 Hours] **[Max. Marks : 44**

Note :– Attempt *five* questions in all, selecting *two* questions from each Unit (I & II). Unit III is compulsory. Use of non-programmable calculator is allowed.

Unit–I

1. (a) Find the electric field due to uniformly charged wire of length l at a point on its axis.

   (b) Prove that divergence of curl of any vector field is always zero :

$$\vec{\nabla} \cdot \vec{\nabla} \times \vec{A} = 0 \cdot$$ 6,3

2. (a) What is an electric dipole ? Find the electric field due to electric dipole at a point on its axial line.

(b) Two point charges q and $-3q$ are located at a distance d apart. If the electric field at a location of charge q is $\vec{E}$, find the electric field at the location of charge $-3q$. 6,3

3. (a) State and prove Stobe's theorem.

(b) Obtain Gauss's law of electrostatics in its differential form. 6,3

Unit–II

4. (a) Show that potential at a point due to electric dipole is $\frac{\vec{P}}{4\pi \in_0} \text{grad}\left(\frac{1}{r}\right)$ where $\vec{P}$ is the electric dipole moment.

(b) How is the potential difference between two points related to concept of work ? 6,3

5. (a) Derive an expression for electric potential at any point due to an arbitrary charge distribution.

(b) Show that electric potential function $x^2 - y^2 + z$ satisfies Laplace's equation. 6,3

6. (a) What is electrical image ? Find the potential energy of point charge placed near conducting sheet at zero potential.

(b) Prove that the line integral of electric field due to point charge between two points is path independent. 6,3

Unit–III

7. Attempt any *eight* parts :

(i) What is an irrotational field ?

(ii) What is gradient V ?

(iii) What are limitations of Coulomb's law ?

(iv) State law of conservation of charge.

(v) Define electric line of force.

(vi) Define electric flux.

(vii) Can potential at a point be zero if electric field there is not zero ? Explain.

(viii) What is conservative field ?

(ix) What is atomic polarizability ?

(x) Define electrical susceptibility. 1×8=8