

(i) Printed Pages: 3

Roll No.

(ii) Questions : 7

Sub. Code :

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Exam. Code :

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

1128

PHYSICS

Paper-C : Electricity and Magnetism—I

Time Allowed : Three Hours]

[Maximum Marks : 22

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

UNIT—I

1. (a) Derive an expression for electric field due to uniformly charged circular disc having surface charge density σ and a point on the axis of disc.
(b) Prove that curl of gradient of any **scalar** field is always zero. $\vec{\nabla} \times \vec{\nabla} V = 0$. 3,1.5
2. (a) State and prove Green's theorem.
(b) A charge $q_1 = 400 \mu\text{C}$ exerts force of $60\hat{i} - 80\hat{j}\text{N}$ on an unknown charge q_2 in vacuum separated by distance of 30 m. Find the charge q_2 . 3,1.5
3. (a) What is an electric dipole ? Find the electric field due to electric dipole at a point on its equatorial line.
(b) State and prove Gauss law. 3,1.5

UNIT—II

4. (a) Show that the electrostatic field satisfies the equations $\vec{\nabla} \times \vec{E} = 0$ and $\vec{\nabla} \cdot \vec{E} = \rho/\epsilon_0$.
- (b) Show that in an electrostatic field \vec{E} the potential difference between the two points A and B is given by :

$$V_B - V_A = - \int_A^B \vec{E} \cdot d\vec{r}. \quad 3,1.5$$

5. (a) Define atomic polarizability α . Show that dipole moment induced in an atom subjected to an electric field \vec{E}_0 is given by $\vec{P} = \alpha \vec{E}_0$.
- (b) Two point charges $+4 \mu\text{C}$ and $-6 \mu\text{C}$ are separated by a distance of 20 cm in air. At what points on the line joining these charges the electric potential will be zero ?
3,1.5
6. (a) Derive an expression for electric potential at any point due to linear quadrupole.
- (b) Define equipotential surface. Show that the electric field is always perpendicular to equipotential surface.
3,1.5

UNIT—III

7. Attempt any **eight** parts :
- (i) What is solenoidal field ?
- (ii) If the gradient of scalar V vanishes at a point, what do you conclude about V ?

- (iii) What is angle between electric dipole moment and electric field due to it on equatorial line ?
- (iv) How do we represent electric field by lines of force ?
- (v) What is the electric flux through a closed surface surrounding an electric dipole ?
- (vi) What is conservative field ?
- (vii) What is Laplace's equation ?
- (viii) What are dielectrics ?
- (ix) Define electrical susceptibility.
- (x) Define coulomb.

$$\frac{1}{2} \times 8 = 4$$