**TOPIC – 1**

**ELECTRIC FORCE**

1] Force experienced by point charge due to semi-circular (radius=R) distribution of charge of a given charge per unit length..

a) b) c) d) None

2] The force experienced by point charge due to quadrant distribution of charge where a given charge is distributed uniformly over the length of the quadrant is.



a) b) c) d) None

3] For the following charge distribution, the net force on charge +q.



a) b) c) d) None

**ANSWER KEY**

1] 2] 3]

**TOPIC – 2**

**ELECTRIC FIELD**

1] In a region, distribution of point charges exists as +q[a,0,0], -q[0,a,0] and +q[a,0,0]. Find the electric field at origin.

a) b)

c) d)

2] Find the electric field due to infinitely defined line charge at point P as shown in the figure.



(Hint: Revise Class problem - 2(B) Session 2. Limit of integration is to )

a) b) c) d) None

3] The electric field due to semicircular charge as shown in the figure at point P.



a) b) c) d) None

4] The electric field due to quadrant charge at point P is.



a) b) c) d) None

5] A charge q = is placed at point (1m, 2m, 4m). The electric field at point P   
(0m, –4m, 3m) is.

a) 240 N/c along b) 247 N/c along

c) 237 N/c along d) None

6] In the following diagrams, electric charges are distributed uniformly with l Cm–1. The field intensity at P in each case is.

a) b) c) d) None

7] Find the maximum electric field intensity on the axis of a uniformly charged ring of charge q and radius R.

a) b) c) d) None

8] A 10cm long rod carries a charge of + 50mC distributed uniformly along its length. Find the magnitude of the electric filed at a point 10 cm from both the ends of the rod.

a) b) c) d) None

**ANSWER KEY**

1] a 2] a 3] b 4] b 5] c 6] b 7] 8]

**TOPIC – 3**

**ELECTRIC FLUX**

1] Find the electric flux through the considered circular surface.



a) b) c) d) none

2] Find the electric flux through the closed surface of the cylinder.



a) b) c) d) none

3] Find the electric flux through the surface of hemisphere placed in closed electric field.



a) b) c) d) none

4] Three point charges –q, +q and Q are placed in a region as shown. P is a point on imaginary Gaussian sphere enclosing –q and +q and Q is outside. Find total flux through the spherical surface.



a) b) c) d) none

5] A charge Q is placed at the centre of an imaginary hemispherical surface. Using symmetryarguments and the Gauss’s law, find the flux of the electric field due to this charge through the surface of the hemisphere (figure).



a) b) c) d) none

**ANSWER KEY**

1] b 2] a 3] a 4] a 5] c

**TOPIC – 4**

**APPLICATION OF GAUSS LAW-1**

1] An infinite line charge produces a field of9104 N/C at a distance of 2 cm. Calculate the linear charge density.

a) b) c) d) none

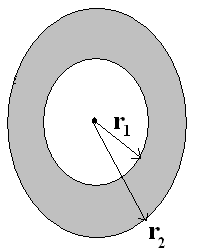
2] Obtain the formula for the electric field due to a long thin wire of uniform linear charge densitywithout using Gauss’s law. [Hint: Use Coulomb’s law directly and evaluate the necessary integral.]

a) b) c) d) none

3] A long charged cylinder of linear charge densityis surrounded by a hollow co-axial conducting cylinder. What is the electric field in the space between the two cylinders?

a) b) c) d)

4] A charge Q is distributed uniformly within the material of a hollow sphere of inner and outer radii and Find the electric field at a point P a distance away from the centre for as a function of x for 0 < x < 2



(i)

a) 0 b) c) d) none

(ii)

a) b) c) d) none

(iii)

a) b) c) d) none

**ANSWER KEY**

1] a 2] b 3] a 4] (i) a (ii) a (iii) c

**TOPIC – 5**

**APPLICATION OF GAUSS LAW-2**

1] For the spherical charge distribution as shown in the figure the charge per unit volume is not constant and depends on radial distance from the centre r as given in the figure.



Find the electric field in the region- a] r < Rb] r> = R

(i)

a) b) c) d)

(ii)

a) b) c) d)

2] Find the ratio of electric fields at points A and B and the difference between the potentials at points A and B for the following charge distribution.



Find

a) b) c) d)

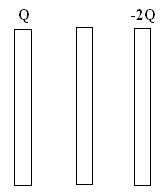
3] For uniform distribution of charge in spherical volume of radius R there are 2 points A and B at a distance of R/3 from the surface such that A lies inside the surface and B lies outside the surface.



Find

a) b) c) d)

4] Three identical metal plates with large surface areas are kept parallel to each other as shown in figure. The left-most plate is given a charge Q, the right-most a charge - 2Q and the middle one remains neutral. Find the charge appearing on the outer surface of the rightmost plate.



a) b) c) d) None

5] If three infinite charged sheets of uniform surface charge densities s, 2s and –4s are placed as shown in figure, then find out electric field intensities at points A, B, C, D



(i) A

a) b) c) d) none

(ii) B

a) b) c) d) none

(iii) C

a) b) c) d) none

(iv) D

a) b) c) d)

**ANSWER KEY**

1] (i) a (ii) a 2] a 3] c 4] c 5] (i) a (ii) c (iii) b (iv) c

**TOPIC – 6**

**ELECTRIC DIPOLE**

1] A charge is situated at a certain distance from an electric dipole in the end-on position experiences a force F. If the distance of the charge is doubled, the force acting on the charge will be:

a) F/4 b) F/8 c) 2F d) F/2.

2] A system has two charges qA = 2.510–7 C and qB = – 2.510–7 C located at points A: (0, 0, –15 cm) and B: (, 0, + 15 cm), respectively. What are the total charge and electric dipole moment of the system?

a) b) c) d) none

3] An electric dipole with dipole moment 410–9 C m is aligned at 30o with the direction of a uniform electric field of magnitude 5104 NC–1. Calculate the magnitude of the torque acting on the dipole.

a) b) c) d) none

4] Figure shows an electric dipole formed by two particles fixed at the ends of a light rod of length l. The mass of each particle is m and the chargers are –q and +q. The system is placed in such a way that the dipole axis is parallel to a uniform electric field E that exists in the region. The dipole is slightly rotated about its centre and released. Show that for small angular displacement, the motion is angular simple harmonic and find its time period.



5] Assertion: On going away from a point charge or small electric dipole, electric field decreases at the same rate in both the cases.

Reason: Electric field is inversely proportional to square of distance from the charge.

6] In a certain region of space, electric field is along the z-direction throughout. The magnitude of electric field is, however, not constant but increases uniformly along the positive z-direction, at the rate of 105 NC–1 per metre. What are the force and torque experienced by a system having a total dipole moment equal to 10–7 Cm in the negative z-direction?

a) 100N b) c) d) none

7] a) Consider an arbitrary electrostatic field configuration. A small test charge is placed at a null point (i.e., where E = 0) of the configuration. Show that the equilibrium of the test charge is necessarily unstable.

b) Verify this result for the simple configuration of two charges of the same magnitude and sign placed a certain distance apart.

8] Figure shows a charge array known as an electric quadrupole. For a point on the axis of the quadrupole, obtain the dependence of potential on r for r/a >> 1, and contrast your results with that due to an electric dipole, and an electric monopole (i.e., a single charge).



a) b) c) d) none

**ANSWER KEY**

1] b 2] a 3] b 4] 2 5] Assertion is False, Reason is True 6] b 8]a