UNIT – I : ELECTROSTATICS

ONE MARK QUESTIONS

Q1 Define electric dipole moment. Write its SI unit.

Q2. A hollow metal sphere of radius 5cm is charged such that the potential on its surface is 10V.What is the potential at the centre of the sphere ?

Q3 Charges of magnitudes 2Q and –Q are located at points (a,0,0) and (4a ,0,0) .Find the ratio of the flux of electric field ,due to these charges ,through concentric spheres of radii 2a and 8a centred at origin ?

Q4 Two electrically charged particles ,having charges of different magnitude ,when placed at a distance d from each other ,experience a force of attraction F .These two particles are put in contact and again placed at the same distance `from each other.What is the nature of new force between them ?Is the magnitude of the force of attraction between them now more or less than F ?

Q5 If the radius of the Gaussian surface enclosing a surface is halved ,how does the electric flux through the Gaussian surface change?

Q6.Draw an equipotential surface for a uniform electric field.

Q7 Name the physical quantity whose SI unit is

- **(i) Coulomb/volt**
- **(ii) Newton/coulomb.**
- **(iii) Joule/coulomb**

Q8 Two electric field lines never cross each other .Why ?

Q9.Is it possible for a metal sphere of 1cm radius to hold a charge of 1C ?

Q10 A charge of 2C moves between two plates maintained at a potential difference of 1 volt .What is the energy acquired by the charge ?

TWO MARKS QUESTIONS

Q11. A thin straight infinitely long conducting wire having charge density λ is enclosed by a cylindrical surface of radius r and length l, its axis coinciding with the length of the wire.Find the expression for the electric flux through the surface of the cylinder.

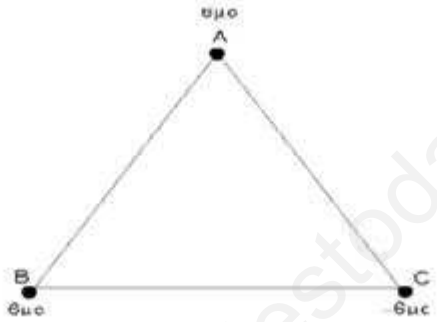
Q12 Find the amount of work done in rotating an electric dipole of dipole moment 3 x 10^{-8} Cm from its position of stable equilibrium ,to position of unstable equilibrium , in a uniform electric field of intensity 10^4 N/C

Q13 Justify that the electrostatic potential is constant through the volume of a charged conductor and has the same value on its surface as inside it.

Q14 A capacitor is charged with a battery and then its plate separation is increased without disconnecting the battery. What will be the change in

(a) **Charge stored in the capacitor.**
(b) **Energy stored in the capacitor**
(c) **Potential difference across the plates of the capacitor?**
(d) **Electric field between the plates of the capacitor?**

Q15 Find the amount of work done in arranging the three point charges, on the vertices of an equilateral triangle , ABC , of side 10 cm as shown in figure.



Q16 Using Gauss law establish that the magnitude of electric field intensity , at a point , due to an infinite plane sheet , with uniform charge density σ is independent of the distance of the field point.

Q17. Define an electric field line . Draw the pattern of the field lines around a system of two equal positive charges separated by a distance .

THREE MARKS QUESTIONS

Q18 Two uniformly large parallel thin plates having charge densities +σ and –σ are kept in the X-Z plane at a distance 'd' apart.Sketch an equipotential surface due to electric field between the plates.If a particle of mass m and charge –q remains stationary between the plates,what is the magnitude and direction of this field?

Q 19 Using gauss's law obtain the expression for the electric field due to a uniformly charged thin spherical shell of radius R at a point outside the shell .Draw a graph showing the variation of electric field with r,for r> R and r< R.

Q20 Show mathematically that sharing of charges between two capacitors (or conductors) ,is always accompanied with some loss of electrostatic energy.

FIVE MARKS QUESTIONS

Q21 Find the expression for the electric field intensity and the electric potential due to a dipole at a point on the equatorial line.Would the electric field be necessarily zero at a point where the electric potential is zero ?Give an example to illustrate your answer.

Q22 Find the expression for the capacitance of a parallel plate capacitor of area A and separation d if (i) a dielectric slab of thickness t , and (ii) a metallic slab of thickness t, where (t<d) are introduced one by one between the plates of the capacitor .In which case would the capacitance be more and why ?

Q23 Three identical parallel plate (air) capacitors C_1 ,C_2,C_3 have capacitances C each .The space between their plates is now filled with dielectrics as shown .If all the three capacitors still have equal capacitances , obtain the relation between the dielectric constants K , K_1 , K_2 , K_3 and K_4 .