Electrostatic Potential and Capacitance

Chapter -2 (30 marks)

(1× 5 = 5)

Q1. What is the electrostatic potential due to an electric dipole at an equatorial point.

Q2. What is the work done in moving a test charge q through a distance of 1 cm along the equatorial axis of an electric dipole.

Q3. Define the term 'potential energy' of charge 'q' at a distance V in an external electric field.

Q4. A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 V. What is the potential at the centre of the sphere.

Q5. Why is electrostatic potential constant throughout the volume of the conductor and has the same value (as inside) on its surface.

(2×3=6)

Q6. Derive the expression for the electric potential at any point along the axial line of an electric dipole.

Q7. Two point charges, q1 = 10 × 10-8C, q2 = -2 × 10-8C are seperated by a distance of 60 cm in air.

(i) Find at what distance from the 1st charge, q1 would the electric potential be zero.

Q8. Why is electrostatic potential constant throughout the volume of the conductor and has the same value (as inside) on its surface.

(3×3=9)

Q9. Net capacitance of three identical capacitors in series is 1 pF. What will be their net capacitance if connected in parallel.

Q10. Two point charges q1 and q2 are located at r1→ and r2→ respectively in an external electric field E.Obtain the expression for the total work done in assembling this configuration.

Q11. Deduce the relation between the electric field and the potential gradient between them. Write the two important conclusions concerning the relation between the electric field and electric potentials.

(2×5 = 10)

Q12. Deduce the expression for the electrostatic energy stored in a capacitor of capacitance 'C' and having charge 'Q'.

How will the

(i) energy stored and

(ii) the electric field inside the capacitor be affected when it is completely filled with a dielectric material of dielectric constant 'K'.

Q13. Obtain the expression for the potential due to a point charge.

(b) Use the above expression to show that the potential, due to an electric dipole (length 2a), varies as the 'inverse square' of the distance r of the 'field point' from the centre of the dipole for r > a.