Physics XII

class-12th chapter: Electrostatic Potential & Capacitance
paper 01

Time : 1:30hr   **M.marks : 25**

General instructions

1. **Question Paper contains four sections.**
    Section A contains 1 questions of 1 mark
    Section B contains 4 questions of 2 marks
    Section C contains 2 questions of 3 marks
    Section D contains 2 questions on 5 marks

2. **All questions are compulsory.**

Section A

Q.1 what is dielectric constant?

Key- It is the ratio of permittivity in any medium to permittivity of the medium in air and vacuum.

Section B

Q.2 Define the term electric dipole moment? and its S.I unit.

Key- Product of magnitude of given charge particle and in dipole length. And S.I unit is coulomb meter or cm.

Q.3 Two electric field lines never cross each other. why?

Key- If they intersect, then there will be two direction of electric field at the point of intersection which is not possible.

Q.4 Distinguish between electric potential and potential energy.

Key-   Electric potential- Amount of work done in moving a unit the charge from infinity to that point.

Potential energy- Energy possessed by virtue of its particular position.

Q.5 What is the work done by the field of nucleus in a complete circular orbit of electron? What if the orbit is elliptical?

Key- Zero, work is done in moving an electron from one position to other in elliptical orbit.net work done over a complete orbit is zero because electrostatic force are conservative force.

Section C

Q.6 Define the term ''Gauss's law '' and derive it?

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Key- The surface integral of electric field over a closed surface area is net
electric flux induced in the circuit.

$$E = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q}{r^2} \qquad\qquad EA = \frac{Q}{\varepsilon_0}$$

Q.7 A parallel plate air capacitor has a capacitance of $5\mu f$. On introducing slab of equal to one fourth of the distance between the plate, what would be increase in capacity?

Key- $C_0 = \frac{\varepsilon A}{d} = 5$ and $C = \frac{\varepsilon A}{d-t}$

$\qquad\qquad T = \frac{d}{4}$

$\qquad\qquad 6.67\mu f$ Ans

Increase in capacity = C - C$_0$

$\qquad\qquad$ = 6.67 - 5   = $1.67\mu F$

Section D

Q.8 Derive and expression for the capacitance of a parallel plate capacitor? Calculate capacitance of a parallel plate capacitor with area of each plat 1cm$_2$ and separation 1mm.

Key- $E = \frac{\sigma}{2\varepsilon.}$, Net electric field = E = E$_1$-E$_2$

$\qquad\qquad E = \frac{\sigma}{\varepsilon}$ we know that E= -dv/dx

$E = \frac{v}{x}$

$V = \frac{\sigma}{\varepsilon}$x d

$C = \frac{q}{v}$

$\qquad C = \frac{\varepsilon A}{d}$

$\qquad\qquad 8.85\times 10^{-13}$ farad

Q.9 Two charge 5 X10^{-8} C and -3 X 10^{-8}C are located 16cm apart. At what point on the line joining the two charges is the electric potential zero.

Key- $V = \frac{q_1}{4\pi\varepsilon r_1} + \frac{q_2}{4\pi\varepsilon r_2}$

$\qquad\qquad X = 10$ cm

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