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ASSIGNMENT #02 'APPLIED PHYSICS'

NAME: MASOOD AHMED

ID: 38186

PROGRAM: BS(CS)

Q1:-

(i) Describe why Gauss's Law was introduced in physics? Write down its expression.

Ans:- Gauss's Law is a fundamental principle in physics that relates the electric flux through a closed surface to the charge enclosed within that surface. Gauss's Law was introduced in physics to relate the behaviour of electric charges to the properties of electric fields. It was discovered by Carl Friedrich Gauss, a German mathematician in the early 19th century.

The mathematical expression for Gauss's Law is given by:

$$\oint E \cdot dA = \frac{Q}{\epsilon_0}$$

$\therefore E$ is electric field

dA small area

ϵ_0 permittivity.

(ii) Write down the steps required to calculate the E-field when we use Gauss's Law.

Ans: To calculate E-field using Gauss's Law, we need to follow the following steps.

- 1- Choose a closed surface that encloses the charge distribution whose electric field we want to calculate.
- 2- Determine the total charge enclosed by the surface.
- 3- Calculate the electric flux $\oint \vec{E} \cdot d\vec{A}$.
- 4- Equate the electric flux to the total enclosed charge divided by the electric constant ϵ_0 .
- 5- Solve the resulting equation for the electric field \vec{E} .

Q2:

(i) point charge q :

It can be used to find the electric field due to a point charge q .

(ii) Line of charge with λ as linear charge density.

It can be used to find the E-field due to an infinitely long line of charge with a linear charge density λ .

(iii) horizontal cylinder in Electric Field:-

Gauss's Law can be used to show that the electric field inside a horizontal cylinder in a uniform electric E-field is zero.