Physics - Units and Dimensions

Topics : Computer engineering
Written on March 18, 2024

1. **Introduction:**
    - Units and dimensions are fundamental concepts in physics used to measure physical quantities and describe the relationships between them.
2. **Physical Quantity:**
    - A physical quantity is a property of a phenomenon, body, or substance that can be quantified and expressed numerically.
    - Examples include length, mass, time, temperature, and electric charge.
3. **Units:**
    - Units are standardized quantities used to express measurements of physical quantities.
    - For example, the SI (International System of Units) unit of length is the meter (m), and the SI unit of mass is the kilogram (kg).
    - Units provide a common language for scientists and engineers to communicate measurements and results.
4. **Dimensions:**
    - Dimensions represent the nature or type of a physical quantity, such as length, mass, time, etc.
    - Each physical quantity can be expressed in terms of fundamental dimensions.
    - The fundamental dimensions are typically length (L), mass (M), time (T), electric current (I), temperature (Θ), amount of substance (N), and luminous intensity (J).
5. **Dimensional Analysis:**
    - Dimensional analysis is a technique used to check the consistency of equations and derive relationships between physical quantities.
    - In dimensional analysis, physical quantities are treated as algebraic quantities with dimensions.
    - Equations must be dimensionally consistent, meaning that the dimensions of each term on both sides of the equation must be the same.
6. **Dimensional Homogeneity:**
    - In a dimensionally homogeneous equation, each term has the same dimensions.
    - This property ensures that the equation is physically meaningful and can be used to

derive relationships between physical quantities.

7. **Dimensionless Quantities:**
    - Some quantities are dimensionless, meaning they do not have any physical dimensions.
    - Examples include pure numbers (e.g., π), angles (measured in radians), and certain ratios (e.g., coefficient of friction).