

Matrices and Calculus

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UNIT - I

MATRICES

1.1 INTRODUCTION

The term matrix was apparently coined by Sylvester about 1850, but was introduced first by Cayley in 1860. By a 'matrix' we mean an "arrangement" or "rectangular array" of numbers. Matrices (plural of matrix) find applications in solution of system of linear equations, probability, mathematical economics, quantum mechanics, electrical networks, curve fitting, transportation problems, frameworks in mechanics. Matrices are easily amenable for computers.

A brief revision of matrices, types, properties is presented.

BASIC CONCEPTS

DEFINITIONS

A set of mn numbers (real or complex) arranged in a rectangular array having m rows (horizontal lines) and n columns (vertical lines), the numbers being enclosed by brackets [] or (), is called an $m \times n$ **matrix** (read as " m by n matrix").

An $m \times n$ matrix is also called a matrix of order $m \times n$. Each of the mn numbers is called an **element** of the matrix.

For example, $\begin{bmatrix} 2 & -1 & 5 \\ 3 & 0 & 4 \end{bmatrix}$ is a 2×3 matrix or matrix of order 2×3 . It has two rows and three columns. The numbers 2, -1, 5, 3, 0, 4 are its elements.

An $m \times n$ matrix is usually written as

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & \dots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \dots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \dots & a_{3n} \\ \dots & \dots & \dots & \dots & \dots \\ a_{m1} & a_{m2} & a_{m3} & \dots & a_{mn} \end{bmatrix}.$$