MATRICES

INTRODUCTION OF MATRIX

DEFINITION

A matrix is a rectangular array of mn elements in m rows and n columns enclosed within

brackets.

$$A = [a_{ij}] = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1j} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2j} & \dots & a_{2n} \\ \vdots & \vdots & & \vdots & & \vdots \\ a_{i1} & a_{i2} & \dots & a_{ij} & \dots & a_{in} \\ \vdots & \vdots & & \vdots & & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mj} & \dots & a_{mn} \end{bmatrix}$$

is a matrix of order (dimension or size) m × n, to be read as m cross n or m by n. a_{ij} is the

element present in the ith row and j^{th} column of the matrix. i represents the row rank and j

represents the column rank. Matrices are usually denoted by upper case letters A, B, C, etc.,

where as its elements are denoted by lower case letters a, b, c, etc.,

(i)   The elements a_{11}, a_{22}, a_{33},... are called as diagonal elements. Their sum

  is called as trace of A denoted as tr(A)

(ii)   Capital letters of English alphabets are used to denote matrices.

(iii)   Order of a matrix : If a matrix has m rows and n columns, then we say that its order

  is "m by n", written as "m × n".

Ex.1   Construct a matrix A $= [a_{ij}]_{2 \times 2}$ whose elements a_{ij} are given by $a_{ij} = e^{2ix} \sin jx$.

Sol.   For   i $= 1$, j $= 1$, a $_{11} = e^{2x} \sin x$

For $i = 1$, $j = 2$, $a_{12} = e^{2x} \sin 2x$

For $i = 2$, $j = 1$, $a_{21} = e^{4x} \sin x$

For $i = 2$, $j = 2$, $a_{22} = e^{4x} \sin 2x$

Thus $\begin{bmatrix} e^{2x} \sin x & e^{2x} \sin 2x \\ e^{4x} \sin x & e^{4x} \sin 2x \end{bmatrix}$