GATE2024 Engineering Mathematics

Topic: Probability and Statistics

Subtopic: Algebra of Matrices

LECTURE - 1

EXPLANATION

Matrix-

$A = [a_{ij}]_{m \times n}$

$$A = [a_{ij}]_{m\times n} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

Special Types of Matrices:-

- Square Matrix $(m = n)$
- Diagonal Matrix ($a_{ij} = 0$ where $i \neq j$)
- Scalar Matrix ($a_{ij} = k$ where $i = j$)
- Unit Matrix or Identity Matrix (I) ($a_{ij} = 1$ where $i = j$, $a_{ij} = 0$ where $i \neq j$)
- Null Matrix ($a_{ij} = 0$)
- Upper Triangular Matrix ($a_{ij} = 0$, $i > j$)
- Lower Triangular Matrix ($a_{ij} = 0$, $i < j$)
- Idempoten Matrix ($A^2 = A$)
- Involuntary Matrix ($A^2 = I$)
- Nilpoten Matrix $A^x = 0$ ($x \to$ lowest) ($x \to$ Index)
- Singular Matrix $|A| = 0$
- Row Matrix $m = 1$ (No. of Row)
- Column Matrix $n = 1$ (No. of Column)

NOTES PREPARED BY: ANKIT ARORA

EXPLANATION

Equality of Two Matrices:-

Two matrices $A = [a_{ij}]$ and $B = [b_{ij}]$ are said said to be equal if,

1. They are of same size.
2. The elements in the corresponding places of two matrices are the same i.e. $a_{ij} = b_{ij}$ for each pair of subscripts i and j.