Matrices

Concepts and Types - Part II

Matrices and their Types

❖ **Special Forms of Square Matrix:**

I. **Diagonal Matrix:** If all the off-diagonal elements of matrix are zero, the matrix is called diagonal matrix. For example:

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$ is a diagonal matrix.

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II. **Identity Matrix:** If all the diagonal elements are equal to 1 and all the off-diagonal elements of matrix are zero, the matrix is called identity matrix and is denoted by I. For example:

$$I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ is an identity matrix.

Pre and post multiplying identity matrix gives identity matrix.

i.e. $I = I'$

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- Pre multiplication or post multiplication of an identity matrix with any square matrix leave the square matrix unchanged.

  i.e. IA = AI = A (A is square matrix)

III. Triangular Matrix: It is a square matrix of the form

$$A = \begin{bmatrix} a_{11} & \times & \times \\ 0 & a_{22} & \times \\ 0 & 0 & a_{33} \end{bmatrix}$$

Where, × refers to any value.

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IV. **Symmetric Matrix:** A square matrix which has same elements in arrangements on both sides of diagonal elements from north west to south east. For example, matrix A

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

The matrix **A** would be symmetric matrix if $a_{12} = a_{21}; a_{13} = a_{31}; a_{23} = a_{32}$

- Transpose of symmetric matrix is matrix itself.

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- **Idempotent Matrix:** A symmetric matrix that produces itself when multiplied by itself is called idempotent matrix.

$$i.e.\ AA = A$$

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THANK YOU