Matrix

order = m × n

Types of Matrix :-

① **Row Matrix :-** if a matrix has only 1 Row.

Ex: $A = \begin{bmatrix} 0 & 1 \end{bmatrix}_{1\times 2}$ and $B = \begin{bmatrix} 1 & \sqrt{3} & 0 & \frac{1}{2} \end{bmatrix}_{1\times 4}$

$\Rightarrow$ i.e. $\rightarrow$ **order = 1 × n**

② **Column Matrix :-** if a Matrix has only 1 Column.

Ex:- $A = \begin{bmatrix} 0 \\ -1 \end{bmatrix}_{2\times 1}$ & $B = \begin{bmatrix} -\frac{1}{2} \\ \sin\pi \\ -8 \end{bmatrix}_{3\times 1}$

order :- = m × 1

Matrix

Types of Matrix :-

3) Square Matrix :- if in a matrix no. of Row is equal to no. of Columns. i.e. → $m = n$ ✓

$$D = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix}_{4\times4}$$

Ex:-

$$A = \begin{bmatrix} 1 \end{bmatrix}_{1\times1}$$

$$B = \begin{bmatrix} 0 & 1 \\ 5 & -7 \end{bmatrix}_{2\times2}$$

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 6 & 9 \\ 0 & -1 & 3 \end{bmatrix}_{3\times3}$$

$$\begin{bmatrix} \text{order} = m\times m \\ \text{or} \\ \text{order} = n\times n \end{bmatrix}$$

→ here in Square Matrix

A = 1 is diagonal elements

B = 0 & -7 are diagonal elem.

C = 1, 6 & 3 are --- 11 --- .

Matrix

Types of Matrix :-

(4) **Diagonal Matrix :-** if in a square Matrix, all the elements except diagonal are zero than that is known as diagonal Matrix.

Ex!- $A = \begin{bmatrix} 2 & 1 & -5 \\ 7 & 2 & 5 \\ 1 & 3 & 9 \end{bmatrix}_{3\times3}$, $B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & -5 \end{bmatrix}_{3\times3}$

$\rightarrow B = [b_{ij}]_{m\times m}$

$b_{ij} = 0 \rightarrow$ if $i \neq j$

$b_{ij} \neq 0 \rightarrow$ if $i = j$

↓

it is the Condition for diagonal Matrix.

↓

Square Matrix

↓

Diagonal Matrix

Matrix

Types of Matrix :-

⑤ Scalar Matrix :- if in a diagonal matrix all the diagonal Elements are same.

here :- $C = [c_{ij}]_{m \times m} \rightarrow \begin{bmatrix} c_{ij} = 0 & \text{when } i \neq j \\ c_{ij} = k, & \text{when } i = j \end{bmatrix}$

$A = \begin{bmatrix} -5 & 4 \\ 1 & 2 \end{bmatrix}_{2\times 2}$, $B = \begin{bmatrix} -5 & 0 \\ 0 & 3 \end{bmatrix}_{2\times 2}$, $C = \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}_{2\times 2}$

Sq. ✓ | Sq. ✓ | Sq. ✓
dig ✗ | dig ✓ | dig ✓
Scal ✗ | Scal ✗ | Scal ✓

Matrix

$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}_{3\times3}$ $I_1 = [1]_{1\times1}$

Types of Matrix :-

⑥ Identity Matrix :- is in a scalar matrix, all diagonal elements become 1, than that is Identity Matrix.

$D = [d_{ij}]_{m\times m} \Rightarrow \begin{bmatrix} d_{ij} = 0 ; & i \neq j \\ d_{ij} = 1 ; & i = j \end{bmatrix}$

$A = \begin{bmatrix} -5 & 4 \\ 1 & 2 \end{bmatrix}_{2\times2}$
Sq. ✓
diag ✗
Scal ✗
Iden ✗

$B = \begin{bmatrix} -5 & 0 \\ 0 & 3 \end{bmatrix}_{2\times2}$
Sq. ✓
diag ✓
Scal ✗
Iden ✗

$C = \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}_{2\times2}$
Sq ✓
diag ✓
Scal ✓
Iden ✗

$D = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}_{2\times2} = I_2$ ✓
Sq. ✓
diag ✓
Scal ✓
Iden. ✓

Matrix

Types of Matrix :-

(1) zero Matrix (null) :- if in a Matrix all elements become zero.

$$O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} ; \quad O = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Matrix

#1 Equality of 2 Matrix:-

Ex:- $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2}$, $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2}$

1) order must be same.

2) Corrosponding Elements should also be same.

Here

$A = B$

Ex:- $C = \begin{bmatrix} 1 & 3 \\ 7 & 5 \end{bmatrix}_{2\times2}$, $D = \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix}_{2\times2}$

→ order same

$C \neq D$