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Mathematics Notes For Class 12 Chapter 3 Matrices

3 MATRICES

KEY CONCEPT INVOLVED

1. **Matrices** - A system of real numbers (real or complex) arranged in a rectangular array of m rows and n columns is called a matrix of order $m \times n$. An $m \times n$ matrix is to be read as ' m by n ' matrix.
(Note: n remains in singular)

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix}$$
- The numbers a_{ij} are called the elements or entries of the matrix. If A is a matrix of order $m \times n$, then we shall write $A = [a_{ij}]_{m \times n}$, where a_{ij} represent the number in the i th row and j th column.
2. **Row Matrix** - A single row matrix is called a row matrix or a row vector. e.g. the matrix $[a_{11} \ a_{12} \ \dots \ a_{1n}]$ is a row matrix.
3. **Column Matrix** - A single column matrix is called a column matrix or a column vector. e.g. the matrix $\begin{bmatrix} a_{11} \\ a_{21} \\ \vdots \\ a_{m1} \end{bmatrix}$ is a column matrix.
4. **Order of a Matrix** - A matrix having m rows and n columns is of the order $m \times n$. i.e. consisting of m rows and n columns is denoted by $A = [a_{ij}]_{m \times n}$.
5. **Square Matrix** - If for $m, n \in \mathbb{N}$ the number of rows and columns of a matrix are equal, say n , then it is called a square matrix of order n .
6. **Null or Zero Matrix** - If all the elements of a matrix are equal to zero, then it is called a null matrix and is denoted by $O_{m \times n}$ or O .
7. **Diagonal Matrix** - A square matrix, in which all its elements are zero except those in the leading diagonal is called a diagonal matrix, thus in a diagonal matrix, $a_{ij} = 0, \forall i \neq j$. e.g. the diagonal matrices of order 2 and 3 are $\begin{bmatrix} k_1 & 0 \\ 0 & 0 \end{bmatrix}$ and $\begin{bmatrix} k_1 & 0 & 0 \\ 0 & k_2 & 0 \\ 0 & 0 & k_3 \end{bmatrix}$.
8. **Scalar Matrix** - A square matrix in which all the diagonal elements are equal and all other elements equal to zero is called a scalar matrix.
i.e. in a scalar matrix $a_{ij} = k, \forall i = j$ and $a_{ij} = 0, \forall i \neq j$. Thus $\begin{bmatrix} k & 0 & 0 \\ 0 & k & 0 \\ 0 & 0 & k \end{bmatrix}$ is a scalar matrix.