Matrices

1. Define a Matrix.

Ans: A Matrix is an ordered rectangular array of numbers or functions.

2. Define a square matrix.

Ans: A matrix in which number of rows equal to number of columns is called a square matrix.

3. Define a diagonal matrix. **(MQP 1)(J 14)**

Ans: A square matrix A is said to be Diagonal matrix, if all the elements except the diagonals are zeros.

4. Define a scalar matrix. **(MQP 5)(M 14)(J 15)(J 16)(M 19)(A 21)**

Ans: A diagonal matrix in which all the diagonal elements are same is called a Scalar matrix.

5. Define Identity matrix.

Ans: A diagonal matrix in which all the diagonal elements are one is called Identity matrix.

6. Define Symmetric matrix.

Ans: A square matrix A is said to be Symmetric if $A' = A$.

7. Define Skew Symmetric matrix.

Ans: A square matrix A is said to be Skew Symmetric if $A' = -A$.

8. Write a 2×2 matrix which is both symmetric and skew symmetric.

Ans: $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$.

9. Define a Matrix which is both symmetric and skew symmetric.

Ans: Null Matrix.

10. If a matrix has 5 elements, what are the possible orders it can have? **(J 18)(M 20)**

Ans: The possible orders are: 1×5 and 5×1.

11. If a matrix has 8 elements, what are the possible orders it can have?

Ans: The possible orders are: 1×8, 2×4, 4×2 and 8×1.

12. Construct a 2×2 matrix $A=\left[a_{ij}\right]$, whose elements are given by $a_{ij}=2i+j$. **(MQP 2)**

Ans: Given, $a_{ij} = 2i + j$

$\therefore\ a_{11} = 2(1)+1 = 3 \quad a_{12} = 2(1)+2 = 4 \quad a_{21} = 2(2)+1 = 5 \quad a_{22} = 2(2)+2 = 6$

$$A = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}.$$

13. Construct a 2×2 matrix $A=\left[a_{ij}\right]$, whose elements are given by $a_{ij}=\dfrac{i}{j}$.

(MQP 3) (M 17) (J 17) (M 18)(S 20)

Ans: Given, $a_{ij}=\dfrac{i}{j}$

$\therefore\ a_{11}=\dfrac{1}{1}=1 \qquad a_{12}=\dfrac{1}{2} \qquad a_{21}=\dfrac{2}{1}=2 \qquad a_{22}=\dfrac{2}{2}=1$

$$A=\begin{bmatrix} 1 & \frac{1}{2} \\ 2 & 1 \end{bmatrix}.$$

14. Construct a 2×2 matrix $A=\left[a_{ij}\right]$, where $a_{ij}=\dfrac{i-j}{2}$. **(MQP 4)**

Ans: Given, $a_{ij}=\dfrac{i-j}{2}$

$\therefore\ a_{11}=\dfrac{1-1}{2}=0 \qquad a_{12}=\dfrac{1-2}{2}=-\dfrac{1}{2} \qquad a_{21}=\dfrac{2-1}{2}=\dfrac{1}{2} \qquad a_{22}=\dfrac{2-2}{2}=0$

$$A=\begin{bmatrix} 0 & -\frac{1}{2} \\ \frac{1}{2} & 0 \end{bmatrix}.$$

15. Construct a 2×2 matrix $A=\left[a_{ij}\right]$, whose elements are given by $a_{ij}=\dfrac{1}{2}\left|-3i+j\right|$.

(J 19)(M 15)

Ans: Given, $a_{ij}=\dfrac{1}{2}\left|-3i+j\right|$

$\therefore \qquad a_{11}=\dfrac{1}{2}\left|-3(1)+1\right|=1 \qquad a_{12}=\dfrac{1}{2}\left|-3(1)+2\right|=\dfrac{1}{2}$

$a_{21}=\dfrac{1}{2}\left|-3(2)+1\right|=\dfrac{5}{2} \qquad a_{22}=\dfrac{1}{2}\left|-3(2)+2\right|=2$

$$A=\begin{bmatrix} 1 & \frac{1}{2} \\ \frac{5}{2} & 2 \end{bmatrix}.$$

16. Construct a 2×2 matrix whose elements are given by $a_{ij}=\dfrac{(i+j)^2}{2}$.

Ans: Given, $a_{ij} = \dfrac{(i+j)^2}{2}$

$\therefore \quad a_{11} = \dfrac{(1+1)^2}{2} = 2 \qquad a_{12} = \dfrac{(1+2)^2}{2} = \dfrac{9}{2}$

$a_{21} = \dfrac{(2+1)^2}{2} = \dfrac{9}{2} \qquad a_{22} = \dfrac{(2+2)^2}{2} = 8$

$$A = \begin{bmatrix} 2 & \frac{9}{2} \\ \frac{9}{2} & 8 \end{bmatrix}.$$

17. Write the number of all possible matrices of order 3×3 with each entry 0 or 1.

Ans: (Number of possible matrices) = (Number of entries)$^{\text{(order of the matrix)}}$

= $(2)^{3\text{x}3}$

= 512.

18. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$ then find $2A - B$.

Ans: $2A - B = 2\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix} - \begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix} = \begin{bmatrix} -1 & 5 & 3 \\ 5 & 6 & 0 \end{bmatrix}.$

19. Find BA if $A = \begin{bmatrix} 1 \\ 4 \\ 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 8 & 1 \end{bmatrix}$.

Ans: $BA = \begin{bmatrix} 1 & 8 & 1 \end{bmatrix}\begin{bmatrix} 1 \\ 4 \\ 2 \end{bmatrix} = \begin{bmatrix} 1+32+2 \end{bmatrix} = \begin{bmatrix} 35 \end{bmatrix}.$

20. Write the transpose of the matrix $\begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$.

Ans: Let $A = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$, then $A' = \begin{bmatrix} 3 & -1 & 0 \\ 4 & 2 & 1 \end{bmatrix}.$