

# Matrices and Determinants – Brief Notes (MHT-CET Maths)

## 1. Matrix Definition

- A matrix is a rectangular arrangement of numbers in rows and columns.
- General form:  $A = [a_{ij}]$  of order  $m \times n$  ( $m$  rows,  $n$  columns).

## 2. Types of Matrices

- Row matrix – only one row.
- Column matrix – only one column.
- Square matrix – number of rows = number of columns.
- Zero matrix – all elements are 0.
- Identity matrix ( $I$ ) – diagonal elements are 1, others 0.
- Diagonal matrix – non-diagonal elements are zero.

## 3. Matrix Operations

- Addition: possible only if matrices have the same order.
- Scalar multiplication: multiply every element by the scalar.
- If  $A$  is  $m \times n$  and  $B$  is  $n \times p$  then  $AB$  is defined and result is  $m \times p$ .

## 4. Transpose of Matrix

- Transpose of matrix  $A$  is obtained by interchanging rows and columns.
- Notation:  $A^T$

## 5. Determinant

- Determinant is a scalar value associated with a square matrix.
- For matrix  $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$  determinant =  $ad - bc$ .

## 6. Minors and Cofactors

- Minor of element = determinant obtained after deleting its row and column.
- Cofactor =  $(-1)^{i+j} \times \text{Minor}$ .

## 7. Adjoint of Matrix

- Adjoint of matrix = transpose of cofactor matrix.
- Notation:  $\text{adj}(A)$

## 8. Inverse of Matrix

- If  $\det(A) \neq 0$  then inverse exists.
- Formula:  $A^{-1} = \text{adj}(A) / |A|$

### **9. Properties of Determinants**

- If two rows or columns are equal  $\rightarrow$  determinant = 0.
- Interchanging two rows changes the sign of determinant.
- If one row is multiple of another  $\rightarrow$  determinant = 0.

### **10. Solving Linear Equations**

- Using inverse matrix method:  $X = A^{-1}B$ .
- Used to solve simultaneous linear equations.

### **11. Important CET Tips**

- Remember determinant formula for  $2 \times 2$  and  $3 \times 3$  matrices.
- Practice properties of determinants.
- Inverse matrix questions are common in CET.