**Matrices**

1. **Definitions**

* A matrix is a set of real or complex numbers (or element) arranged in rows and columns to form a rectangular array.
* A matrix having *m* rows and *n* columns is called an matrix and is referred to as having order .
* A matrix is indicated by writing the array within large square brackets.

Where

**Special Matrices**

1. Line matrix: Line matrix consists of one row only.
2. Column matrix: Column matrix consists of one column only.
3. Square matrix: Square matrix is a matrix of order .
4. Diagonal matrix: Diagonal matrix is a square matrix with all elements zero except those on the leading diagonal.
5. Unit matrix: Unit matrix is a diagonal matrix in which the elements on the leading diagonal are all unity.

The unit matrix is denoted by I.

1. **Addition and subtraction of matrices**

To be added or subtracted two matrices must be of the same order. The sum or difference is then determined by adding or subtracting correspond elements.

***Example1****:* If and

determine a) and b)

***Solution:***

1. **Multiplication of matrices**
2. *Scalar multiplication:* To multiply a matrix by a single number, each individual element of matrix is multiplied by that factor, thus

1. *Multiplication of two matrices:* Two matrices can be multiplied together only when the number of columns in the first is equal to the number of rows in the second,thus

*=*

***Homework1:***

If and

determine a) b) c)

1. **Transpose of a Matrix**

If the rows and column of a matrix are interchange, the new matrix so formed is called the transpose of the original matrix.

If is the original matrix, its transpose is denoted by .

***Example2:*** If , determine .

*Solution:* The transpose matrix of (

1. **Determinant of a Square Matrix (3 by 3 matrix)**

The determinant of a square matrix is the determinant having the same elements as those of the matrix, thus

The determinant of and the value of this

A matrix whose determinate is zero is called a *singular* matrix.

***Homework2****:*

***Homework3:***

is a singular matrix.

1. **The inverse of a Matrix (3 by 3 matrix)**

The adjoint of a A is obtained by:

1. Forming of a matrix ***B*** of the cofactors of ***A***
2. Transposing matrix ***B*** to give ***BT***, where ***BT*** is the matrix obtained by writing the rows of B as the columns of ***BT***. Then  ***adjA= BT***

The inverse of matrix ***A, A***-1 is given by

Where ***adj A*** is the adjoint of matrix ***A*** andis the determent of matrix ***A.***

***Example****3*: Determine the inverse of the matrix

***Solution:***

The inverse of a matrix A,

The adjoint of A is formed by:

1. Obtaining the matrix of the cofactors of the element
2. Transposing this matrix

The cofactors of element 3 is

The cofactors of element 4 is

The matrix of cofactors is

The transpose of the matrix of cofactors is

The determent of a matrix A=

***Problem****1*: Determine the inverse of the matrix