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**MATLAB Report**

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**Subject : Mathematics Signature :**

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**Matrix**

**Introduction**

The matrices are the most important tools in modern mathematics developed by Sylvester (1814-1897) and Hamilton. Later 11. was propounded by A. Caley in 1958. Today, It has worde applications in many Helds such as Engineering, Computers, Statistics, Economies, etc. It is also used to solve the system of linear equations.

A matrix is a rectangular arrangement of number in row's and columns and enclosed by a pair of brackets [ ] ( ). Each number of o marry is known as the element or entry of matrix. The number of rows followed by the numbers of columns gives the Order or size or dimension of a matrix.

**Types of Matrices**

**1**. **Row Matrix:** A matrix having only one row is called a row matrix. for example: [1,2,3]

**2**. **Column Matrix:** A matrix having only one column is called a column marrix.

For example:

**3. Null Matrix :** A matrix of an any order whose elements Cire zero is called null matrix.

For example:

**4. Identity Matrix :** If square matrix whose main diagonal elements are all identity and the other elements are all zero, then it is called identity or unit matrix.

It is denoted by I. I=

**5. Symmetric matrix :** A square matrix A= [a] is called a symmetric matrix, if a-up for all i and j. For example:

**6. Skew Symmetric Matrix :** A square matrix A=[aij] is called a skew symmetric matrix, if aij =-aji for all i and j.

For example:A=

**7. Triangular Matrix :**  A square mark is called triangular maux if all the elements of the matrix above or below the principal diagonal or zero. There are too types of triangular matrices.

1. Upper triangular matrix: A triangular matahy is called the upper triangular matrix if all the elements below the principle diagonal are zero.

For example, aij = 0 for i >

1. Lower triangular matrix: A triangular matrix is called laser triangular matrix if all the elements above the principal diagonal are Zero.

For example, a*ij*=0 for i<j

**Operation on matrix**

**1. Addition of matrix**

Let A= (aij)m\*n and B=(bij)m\*n be two matrix of the same order then the sum of A and B is the new matrix C obtained by adding the corresponding elements of the two matrix A and B. i.c. C = A + B =(Cij) m\*n =(Aij +Bij) m\*n

**2. Subtraction of matrix**

Let A=(aij)m\*n and B=(bij)m\*n be two matrix of the same order then the difference of A and B is the new matrix Cobtained by subtracting the corresponding elements of the two matrix A and B. i.e. C = A - B =(Cij)m\*n =(Aij – Bij) m\*n

**3. Multiplication of matrix by a scalar**

Let A= (aij)m\*n be a matrix and k be a scalar, then the multiplication matrix A by k denoted by kA obtained by multiplying each element of matrix A by scalar k.

i.e. kA =(kAij)m\*n

**4. Multiplication of two matrices**

Let A=(aij)m\*n and B=(bij)q\*n be two matrices then product of the two matrices AB is defined only if p = q.

**Matrix Solution by using Matlab(Lab 1)**

1. **If and Find A+B , A\*B and AT .**

Solution

A=[-1 0 3 ; 4 5 2 ; 7 8 0]

A = 3×3

-1 0 3

4 5 2

7 8 0

B=[7 0 -2 ; 2 2 1 ; -1 4 0]

B = 3×3

7 0 -2

2 2 1

-1 4 0

Addition of Matrices=A+B

Addition = 3×3

6 0 1

6 7 3

6 12 0

Multipication of Matrices=A\*B

Multipication = 3×3

-10 12 2

36 18 -3

65 16 -6

Inverse of A=inv(A)

Inverse = 3×3

-2.2857 3.4286 -2.1429

2.0000 -3.0000 2.0000

-0.4286 1.1429 -0.7143

1. **If A= , B= and Find**

Solution

A=[1 7 ; -2 8]

A = 2×2

1 7

-2 8

>>C=[2,10;3 5]

C = 2×2

2 10

3 5

>>B=[1 5; 6 10]

B = 2×2

1 5

6 10

1. Find A\*(B\*C)

>>A\*(B\*C)

ans = 2×2

311 805

302 810

1. Find (A\*B)\*C

>>(A\*B)\*C

ans = 2×2

311 805

1. 810
2. **Find the inverse of**

Solution

A=[1 4 3;2 1 5;3 2 9]

A = 3×3

1 4 3

2 1 5

3 2 9

inv(A)

ans = 3×3

0.1000 3.0000 -1.7000

0.3000 0 -0.1000

-0.1000 -1.0000 0.7000

1. **Given A= and Find AB and BA**

Solution

A=[4 2 1;3 -7 1]

A = 2×3

4 2 1

3 -7 1

B=[2 3; -3 0; -1 5]

B = 3×2

2 3

-3 0

-1 5

A\*B

ans = 2×2

1 17

26 14

B\*A

ans = 3×3

17 -17 5

-12 -6 -3

1. -37 4
2. **Find the rank of matrix**

Solution

A= [1 2 3 ;2 5 7 ;2 1 0 ]

A = 3×3

1 2 3

2 5 7

2 1 10

rank(A)

ans = 2

**Determinant**

The determinant is defined as a scalar value which is associated with the square matrix.

If X is a matrix, then the determinant of a matrix is represented by Al or deti A). That is an arrangement of the numbers in a square from having equal number of rows and columns, enclosed by two vertical lines on both sides.

**Ways of Finding the Value of Determinant**

1. The value of determinant of square matrix A = (a11) having one row and one column is defined as

|A|=|a11|=a11

1. The value of determinant of square matrix having two rows and two columns defined as :

=a11.a22-a12.a21

1. The value of determinant of square matrix x having three rows and three columns is defined as

=a11(a22.a33-a32.a23)-a12(a21.a33-a31.a23)- a13(a21.a32-a31.a22)

**Sarrus Rule**

We can evaluate the value of the determinant of order 3 with the help of the following method called Sarrus Rule.

Let be a square matrix of order 3. Then write the elements of the given matrix as shown as below.

××

××

××

××

××

××

××

××

**Properties of Determinant**

* If any two rows and columns are same in3×3matrix then its determinant is 0.
* If all elements of a row and column contain 0 in 3x3 matrix then its determinant is 0.
* If we change row or column with another row or column Then we have to put negative sign before the matrix.

**Rank of Matrices**

An m\*n matrix A is said to have a rank r if it has at least one square submatrix of order which is non-singular and all submatrices of order greater than r is singular. It is denoted by p(A) or rank A.

Note: i. The rank r of an m\*n matrix can be equal to the smaller of the number's and n.

ii. An m n matrix A has rank less than n if|A|=0.

**Determinant Solution by Using Matlab(Lab 2)**

1. **Find the determinant of**

Solution

A=[1 4 7;2 1 10;3 2 9]

A = 3×3

1 4 7

2 1 10

3 2 9

det(A)

ans = 44

1. **Find the adjoint of**

Solution

A=[1 2 -2;-1 3 0;0 -2 1]

A = 3×3

1 2 -2

-1 3 0

0 -2 1

det(A)\*inv(A)

ans = 3×3

3.0000 2.0000 6.0000

1.0000 1.0000 2.0000

2.0000 2.0000 5.0000

1. **Find the rank of**

Solution

A=[1 2 3 1;2 5 7 1; 2 1 0 5]

A = 3×4

1 2 3 1

2 5 7 1

2 1 0 5

rank(A)

ans = 3

1. If A= Find A\*A-1

A=[1 2;3 8]

A = 2×2

1 2

3 8

A\*inv(A)

ans = 2×2

1 0

1. 1