— University of Mosul —
College of Petroleum & Mining Engineering

"Computer Programing II /Theoretical"

Second class

Lecture …(4)….

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LECTURE CONTENTS

- Library Function
- Logical Operations
- Flowchart Symbols

Library Functions in MATLAB:

In MATLAB, a **Library Function** refers to a built-in mathematical function that is frequently used in computations and can be accessed at any time. These functions are optimized for performance and accuracy, allowing users to efficiently perform mathematical operations without needing to define them manually. MATLAB provides a vast collection of such functions, including **trigonometric functions, logarithmic functions, exponential functions, statistical functions, and many others**.

Key Categories of Library Functions in MATLAB

1.Trigonometric Functions:

- These functions are used to perform calculations involving angles and trigonometry.
- Examples include:
- sin(x), cos(x), tan(x): Compute sine, cosine, and tangent of an angle (in radians).
- asin(x), acos(x), atan(x): Compute inverse trigonometric functions (arc sine, arc cosine, arc tangent).
- sinh(x), cosh(x), tanh(x): Compute hyperbolic functions.

2.Logarithmic and Exponential Functions:

- These functions are useful for computations involving logarithms and exponentiation.
- Examples include:
- log(x): Computes the natural logarithm of x.
- log10(x): Computes the base-10 logarithm of x.
- exp(x): Computes the exponential function (e^x).
- sqrt(x): Computes the square root of x.

3. Statistical and Mathematical Functions:

- MATLAB provides built-in functions for statistical analysis and mathematical operations.
- Examples include:
- mean(x): Calculates the average value of elements in a vector or matrix.
- median(x): Computes the median value.
- sum(x): Returns the sum of elements in an array.
- prod(x): Computes the product of elements.
- mod(x,y): Returns the remainder after division of x by y.

4.Linear Algebra Functions:

- MATLAB includes a variety of functions for matrix operations and linear algebra computations.
- Examples include:
- inv(A): Computes the inverse of matrix A.
- det(A): Calculates the determinant of a square matrix.
- eig(A): Computes the eigenvalues and eigenvectors of a matrix.
- norm(A): Computes the norm of a vector or matrix.

Logical Operations:-

MATLAB supports logical and comparison operations as it supports mathematical operations. Logical operations and transactions aim to obtain answers to questions that are answered with True or False (True/False).

MATLAB programing in dealing with all logical expressions and comparison operations considers that any non-zero number is True and zero is False, and the output of all logical expressions and comparison operations is a logical answer that contains the number one for True and the number zero for False.

Logical operations include three operations: (and, Or, not), which are symbolized in MATLAB by 1) respectively. The following table shows the results of logical operations (we will symbolize 1 for True and 0 for False).

p	q	P&q	P|q	~ p
1	1	1	1	0
1	0	0	1	0
0	1	0	1	1
0	0	0	0	1

Relational operations:-

Relational operations involve comparing two elements as shown in the following table.

For Example :-

Use the following constants to construct and implement the above relational operations in MATLAB. a=1, b =5

Relational operation	Description
<	Smaller than
<=	Smaller than or equal
>	greater than
>=	greater than or equal
==	equal
~=	Not equal