

MAJLIS ARTS AND SCIENCE COLLEGE  
PG DEPARTMENT OF COMPUTER SCIENCE



# THIRD SEMESTER

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**3<sup>RD</sup> SEM BSc CS, BCA**

**DS –MODULE 1**

**MAJLIS ARTS AND SCIENCE COLLEGE, PURAMANNUR**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**DATA STRUCTURES USING C (3<sup>rd</sup> Semester Online Study Material)**  
**B.Sc Computer Science & BCA**  
(Questions and answers based on **First** Module)

1. Complexity of binary search algorithm is -----

Ans:  $n \log n$

2. Logical or mathematical model of particular organization of data is called -----

Ans: data structure

3. Define data structure?

Ans: Logical or mathematical model of particular organization of data

4. What is a data?

Ans: a single value or a set of values

5. Briefly describe the notation of the space time tradeoff of algorithm.

Ans:

**Time complexity** is a function describing the amount of time an algorithm takes in terms of the amount of input to the algorithm.

**Space complexity** is a function describing the amount of memory (space) an algorithm takes in terms of the amount of input to the algorithm.

Big O notation is the language we use for talking about how long an algorithm takes to run. Order of magnitude is often called **Big-O** notation (for "order") and written as  $O(f(n))$ .

**Common Functions for Big-O**

F(n)	Name
1	Constant
$\log n$	Logarithmic
n	Linear

$n \log n$	Log Linear
$n^2$	Quadratic
$n^3$	Cubic
$2^n$	Exponential

Eg:

Linear search :  $O(n)$

Binary search :  $O(\log n)$

Bubble sort :  $O(n^2)$

Merge sort :  $O(n \log n)$

6. Write different applications of data structure.

Ans:

1. Dynamic memory allocation
2. Maintaining directory of names
3. Performing arithmetic operations on long integers
4. History of visited websites
5. job scheduling

7. What is the importance of Big-O notation?

Ans: It is used to classify algorithms according to how their run time or space requirements grow as the input size grows.

8. What are the different operations that can be performed on different data structure?

Ans:

- Operation means processing the data in the data structure.
- The following are some important operations.
  - a. Traversing
  - b. Searching
  - c. Inserting
  - d. Deleting

e. Sorting

f. Merging

- **Traversing**

To visit or process each data exactly once in the data structure

- **Searching**

To search for a particular value in the data structure for the given key value.

- **Inserting**

To add a new value to the data structure

- **Deleting**

To remove a value from the data structure

- **Sorting**

To arrange the values in the data structure in a particular order.

- **Merging**

To join two same type of data structure values

9. What are the different categories of data structure? Explain.

Ans:

- Primitive
- Non-primitive

Primitive data types:

- These are the data structures which are directly supported by the machine.i.e,Any operation can be performed in these data items.

The different primitive data types are: Integer, Float, Double

Non -Primitive data types:

- These Data structures do not allow any specific instructions to be performed on the Data items directly.

The different non primitive data types are: Arrays, Structures, Unions

Non- primitive data types are again divided into 2

1. Linear
2. Non – linear

Linear Data structures:

- This Data Structures involve arranging the elements in linear fashion.

Eg: Stacks, Queue, Lists

Non- Linear Data structures:

- This Data structures involve representing the elements in Hierarchical order.

Eg: Trees, Graphs

10. Define string? Explain different string operations.

Ans:

Strings are defined as an array of characters. The difference between a character array and a string is the string is terminated with a special character '\0'.

**Operations:**

- 1) Length: Find length of the string. [Number of characters in a string is called its length.]  
Eg: s="computer"  
Length(s) = 8
- 2) Substring: Accessing a substring from a given string.  
SUBSTRING(string, initial,length)  
Eg:  
S="TO BE OR NOT TO BE" , 3,4) =BE O
- 3) Concatenation: let S1 and S2 be strings s1//s2 is the string consisting of the characters of s1 followed by the characters of s2.  
Eg:  
S1= 'welcome'  
S2="majlis"  
S1//s2=" welcomemajlis"
- 4) Indexing (pattern matching): find the position where a string pattern P Firstappears in a given string T.  
Eg:  
T="welcome to majlis college"  
INDEX(T,"to") =8

## 11. Explain Pattern matching algorithm

Ans:

### Pattern matching algorithm

Pattern Searching algorithms are used to find a pattern or substring from another bigger string. There are different algorithms. The main goal to design these types of algorithms to reduce the time complexity. The traditional approach may take lots of time to complete the pattern searching task for a longer text.

Example:

Main String: "ABAAABCDBBABCDEBCABC", Pattern "ABC"

Output:

Pattern found at position: 4

Pattern found at position: 10

Pattern found at position: 18

Algorithm:

P and T are strings with length R and S.

1. set  $k=1$  and  $MAX = S - R + 1$

2. Repeat steps 3 to 5 while  $K \leq MAX$

3. Repeat for  $L=1$  to  $R$

    If  $P[L] \neq T[K+L-1]$  then goto step 5

4. Set  $INDEX = K$  and exit

5. Set  $K = K + 1$

6. Set  $INDEX = 0$

7. Exit