



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

	InSem Examination-IWinter 2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester:III	
	Name of Programme:B.Tech	Pattern:2022	
	Name of Course:Fundamentals of Data Structures	Course Code:COM222001	
	Max. Marks:30	Duration:1	

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 3 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question

**Question No. 1 Attempt following Question**

- a) Explain following terms with suitable example (5) CO1
- 1) Data 2) Data structure 3) Data object 4) Data type 5) ADT

**OR**

- b) Explain best case, average case and worst case time complexity? (5) CO1  
Give suitable example.
- c) Explain static and dynamic data structures with suitable examples (5) CO1

**OR**

- d) Explain the process of reversing a given string, and then discuss the key characteristics that define a good or efficient algorithm (5) CO1

e)

Explain what time complexity means in the context of algorithms, and then determine the time complexity of the provided code.

```
int a [10] = {5, 4, 3, 2, 1}
For (i=0; i<n; i++)
{
    For (j=0; j<=n; j++)
    {
        If (a[j]>a[j+1])
        {
            temp =a[i];
            a[i]=a[j];
            a[j]=temp;
        }
    }
}
```

(5) CO1

**OR**

- f) Describe the measures used to assess the efficiency of an algorithm

(5) CO1

### Question No. 2 Attempt following Question

a)

Illustrate following terms with suitable example

(i) Sequential organization (ii) Multidimensional array (iii) Ordered list (iv) Sparse matrix v) string

(5) CO2

**OR**

- b) Develop ADT for an Array and explain the importance of an ADT

(5) CO2

c)

Given a 2D array `int arr[20][50]` with a base address of 2000 and each element requiring 2 bytes of storage, demonstrate your understanding of memory addressing by calculating the memory addresses of `arr[5][5]` using both row-major and column-major storage representations. Provide a step-by-step explanation for each representation

(5) CO2

**OR**

d)

Develop a C++ pseudo code for implementing following operations:

(5) CO2

1) searching for an element and

2) inserting an element into an array.

Additionally, analyze and justify the time and space complexity for each of these operations in your code

- e) Apply the concept of an Abstract Data Type (ADT) to design a polynomial as an ADT. Represent the polynomial  $10X^3 + 7X^2 + 6X + 5$  using array data structure (5) CO2

**OR**

- f) Develop a pseudo code in C/C++ for efficiently performing the simple transpose operation on a sparse matrix. Comment on the time complexity of your algorithm. Compare simple and fast transpose method (5) CO2