Nirma University

Institute of Technology

Sessional Examination, September 2025

M. Tech. in Computer Science and Engineering, Semester-I /
M. Tech. in Computer Science and Engineering (Data Science), Semester-I /
M. Tech. in Computer Science and Engineering (Cyber Security), Semester-I

6CS402CC22 – Data Structures and Algorithms

Roll / Exam No.	25MCD005	Supervisor's initial with date	

Duration: 2 Hours | Max. Marks: 50

Instructions:

1. **All questions are compulsory. (No Optional Questions)**
2. Figures to right indicate full marks.
3. Assume suitable data if required and specify them clearly.
4. Draw neat sketches wherever necessary.

Q.1 **Do as directed.** **[18]**

A Write an algorithm to determine connected components of an undirected graph G=(V,E). Discuss time complexity of your algorithm. **(08)**
CLO4
BL4

B Write an algorithm for Insertion Sort and present its running time analysis. **(10)**
CLO2
BL3

Q.2 **Answer the following.** **[16]**

A Let $f(n) = 4n^2 + 10n + 7$ and $g(n) = n^2$. Is $f(n) \in O(g(n))$? Justify your answer. **(04)**
CLO1
BL3

B Using the principle of mathematical induction, prove that $n(n + 1)(n + 5)$ is a multiple of 3 for all $n \in N$. **(04)**
CLO1
BL3

C Write an algorithm for Binary Search. Derive its recurrence relation and solve it using recursion tree method. **(08)**
CLO2
BL4

Q.3	**Answer the following.**	**[16]**
A **CLO4** **BL4**	Write an algorithm for Make Change problem using greedy approach and present its running time analysis.	**(06)**
B	**Solve the following recurrence relations.**	**(10)**
CLO1 **BL3**	1) $T(n) = T(n-1) + n$ 2) $T(n) = 25T(n/5) + n^2$	