

**JK Lakshmipat University, Jaipur**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**

End-Term Examination, May 2022  
B. Tech. in CSE, Semester IV (Regular/Backlog)

Roll No.....

**CS1105: Design and Analysis of Algorithms**

**Time: 2 hours**

**Max. Marks: 30**

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**Instructions to students:**

1. Mobile phones are not allowed. Calculators not required.
  2. COs refers to the Course outcomes mentioned in the course description. For administration purpose, students should not bother.
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|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|
| 1 | Suppose that we are given a sequence of $n$ values $x_1, x_2, x_3, \dots, x_n$ and seek to quickly answer repeated queries of the form: given $i$ and $j$ , find the maximum value in $x_i, \dots, x_j$ . Develop a dynamic programming solution to this problem, include recursion, space complexity and time complexity in your answer. Demonstrate your method for the sequence:<br><br>12, 10, 2, 4, 6, 1, 9, 28 for all $i$ and for all $j$ , $0 < i < j < 8$ . | 4+4   | 9   |
| 2 | Given sequence AAABBBCCCBBDAA, find the longest palindromic subsequence using dynamic programming, include recursion, space complexity and time complexity in your answer.                                                                                                                                                                                                                                                                                           | 6     | 8   |
| 3 | Write an efficient algorithm to convert a given adjacency matrix into adjacency lists.                                                                                                                                                                                                                                                                                                                                                                               | 5     | 6   |
| 4 | What is Union-find data structure? Explain its functions and their complexities. Write Kruskal's algorithm using union-find data structure to find Maximal spanning tree in a weighted undirected graph, include example and complexity.                                                                                                                                                                                                                             | 3+3+2 | 7   |
| 5 | What are the differences between Dynamic programming and Divide and Conquer?                                                                                                                                                                                                                                                                                                                                                                                         | 3     | 5   |