

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech/Int. BTech Winter 2024 - 25 Examination

Semester: 5/9

Date: 11/11/2024

Subject Code: 203105374

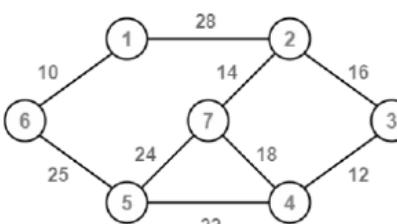
Time: 02:00 pm to 04:30 pm

Subject Name: Design and Analysis of Algorithm

Total Marks: 60

Instructions:

1. This question paper comprises of two sections. Write answer of both the sections in separate answer books.
2. From Section I, Q.1 is compulsory, attempt any THREE from Q. 2 to Q. 5
3. From Section II, Q.6 is compulsory, attempt any THREE from Q. 7 to Q. 10
4. Make suitable assumptions wherever necessary.
5. Start new question on new page.

| Section-A (30 Marks) | | | | | |
|-----------------------------|---|------------|-------------|------------|-------------------------|
| Q.1 | Objective Type Questions - (State, Define, List, etc) (All are compulsory and each of two marks) | (6) | CO | PO | Bloom's Taxonomy |
| | 1. Define Time Complexity and Space Complexity. | | CO 5 | PO1 | REMEMBER |
| | 2. State Principal of Optimality. | | CO 5 | PO1 | REMEMBER |
| | 3. Explain the difference between Divide and Conquer and Dynamic Programming. | | CO 2 | PO1 | REMEMBER |
| Q.2 | Answer the following questions. | | | | |
| | A) Given the following functions, determine the asymptotic relationship between them: $f_1=4n^3+30n^2+10$ $f_2=2n^3$ | (2) | CO 3 | PO2 | APPLY |
| | B) Solve the recurrence relation $T(n)=2T(n-1)+1$ using the substitution method. | (6) | CO 3 | PO3 | UNDERSTAND |
| Q.3 | Answer the following questions. | | | | |
| | A) In the recurrence relation $T(n)=4T(n/3)+n$ 1. How many subproblems are generated at each level of recursion? 2. What is the size of each subproblem at the next level of recursion? | (2) | CO 3 | PO2 | UNDERSTAND |
| | B) Derive the best and worst-case time complexities of Insertion Sort. What role does the initial order of the input play in determining these complexities? | (6) | CO 3 | PO1 | UNDERSTAND |
| Q.4 | Answer the following questions. | | | | |
| | A) Define: MST. | (2) | CO 2 | PO1 | REMEMBER |
| | B) Explain Krushkal's algorithm to find MST of the given graph. | (6) | CO 4 | PO3 | APPLY |
| |  | | | | |
| Q.5 | Answer the following questions. | | CO | | |
| | A) What is Optimization algorithm? | (2) | CO 1 | PO1 | REMEMBER |

| | | | | | |
|--|---|-----|------|-----|-------|
| | B) Find Longest Common Subsequence of given two strings using Dynamic Programming. S1 = {B, C, D, A, A, C, D} S2 = {A, C, D, B, A, C} | (6) | CO 1 | PO3 | APPLY |
|--|---|-----|------|-----|-------|

Section-B (30 Marks)

| | | | | | |
|-------------|---|-----|------|-----|------------|
| Q.6 | Objective Type Questions - (State, Define, List, etc) (All are compulsory and each of two marks) | (6) | | | |
| | 1. Define: Algorithm. What do you mean by finiteness of an Algorithm? | | CO 1 | PO1 | REMEMBER |
| | 2. What is the Best-case and Worst-case time complexity of Quick Sort? | | CO 5 | PO1 | REMEMBER |
| | 3. What is Dynamic Programming technique? | | CO 5 | PO1 | REMEMBER |
| Q.7 | Answer the following questions. | | | | |
| | A) Define: Omega Notation. | (2) | CO 4 | PO1 | REMEMBER |
| | B) Suppose we run Dijkstra's single source shortest-path algorithm on the following edge weighted directed graph with vertex P as the source. Find out the shortest path. | (6) | CO 3 | PO3 | APPLY |
| | | | | | |
| Q.8 | Answer the following questions. | | | | |
| | A) Which Data Structures are used to traverse the graph using DFS and BFS? | (2) | CO 3 | PO1 | REMEMBER |
| | B) Solve the knapsack problem using dynamic programming with a capacity of $W = 7$ and the following items: (Weight = 3, Value = 18), (Weight = 4, Value = 20), (Weight = 2, Value = 10), (Weight = 5, Value = 25). Determine the maximum value that can be obtained. | (6) | CO 2 | PO2 | UNDERSTAND |
| Q.9 | Answer the following questions. | | | | |
| | A) Write the recurrence relation and Time Complexity for Strassen's Matrix multiplication. | (2) | CO 1 | PO1 | REMEMBER |
| | B) Explain DFS Traversal of the graph using an example. | (6) | CO 1 | PO1 | REMEMBER |
| Q.10 | Answer the following questions. | | | | |
| | A) What is the difference between P and NP? | (2) | CO 1 | PO1 | REMEMBER |
| | B) Define N-Queen problem. Explain 4-queens solution using a backtracking approach. | (6) | CO 2 | PO1 | REMEMBER |