

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

Semester: 5/9

Date: 11/11/2024

Subject Code: 203105374

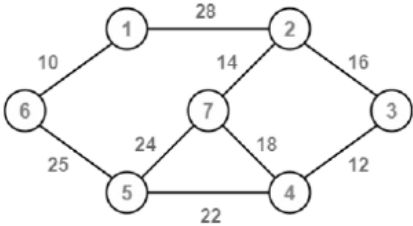
Time: 02:00 pm to 04:30 pm

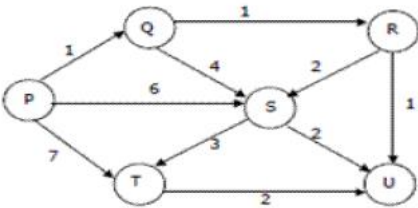
Subject Name: Design and Analysis of Algorithm

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
<b>Section-B (30 Marks)</b>					
<b>Q.6</b>	<b>Objective Type Questions - (State, Define, List, etc)</b> (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
<b>Q.7</b>	<b>Answer the following questions.</b>				
	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
					
<b>Q.8</b>	<b>Answer the following questions.</b>				
	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
<b>Q.9</b>	<b>Answer the following questions.</b>				
	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
<b>Q.10</b>	<b>Answer the following questions.</b>				
	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