Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech/Int. BTech Winter 2024-25 Examination

Semester: 5th/9th **Date: 11/11/2024**

Subject Code: 303105218 **Time: 02:00 pm to 4:30 pm**

Subject Name: Design and Analysis of Algorithms **Total Marks: 60**

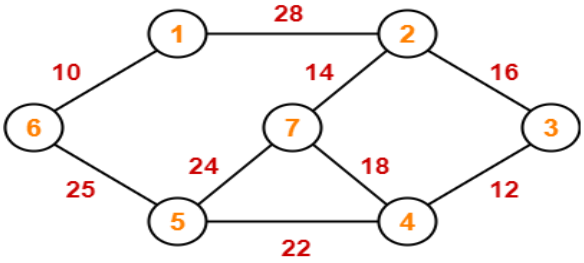
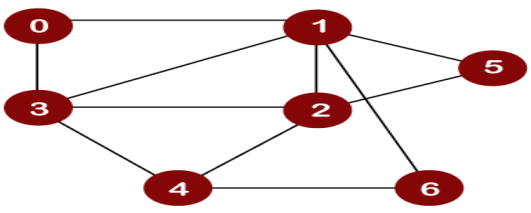
Instructions:

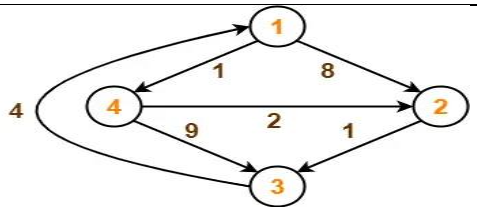
1. This question paper comprises of two sections. Write answer of both the sections in separate answer books.
2. From Section I, **Q.1 is compulsory, attempt any THREE from Q. 2 to Q. 5**
3. From Section II, **Q.6 is compulsory, attempt any THREE from Q. 7 to Q. 10**
4. Make suitable assumptions wherever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

Section-A (30 Marks)					
Q.1	**Objective Type Questions -** (All are compulsory and each of two marks)	**(6)**	**CO**	**PO**	**Bloom's Taxonomy**
	1. What is Theta notation?		**1**	**1**	**Remember**
	2. Define recursion in algorithms.		**1**	**1**	**Remember**
	3. Define divide and conquer.		**1**	**1**	**Remember**
Q.2	**Answer the following questions**.				

	A) Find out the time complexity of given code.
	int fun(int n)
	{ int count = 0;
	for (int i = n; i > 0; i /= 2)
	for (int j = 0; j < i; j++)
	count += 1;
	return count; }
		(2)	**1**	**2**	**Understanding**

	B) Let T(n) be the recurrence relation defined as follows: T(0) = 1,T(1) = 2, and T (n) = 5T (n - 1) - 6T (n - 2) for n ≥ 2 Find out time complexity.	**(3)**	**1**	**2**	**Understanding**
	C) Find Out Time complexity of given equation. T(n) = 3T(n/2)+n^2	**(3)**	**1**	**2**	**Understanding**
Q.3	**Answer the following questions**.				
	A) Discuss Greedy algorithms and dynamic programming with examples.	**(4)**	**2**	**3**	**Understanding**
	B) Discuss the advantages of greedy algorithms over dynamic programming in specific cases.	**(4)**	**2**	**3**	**Understanding**
Q.4	**Answer the following questions**.				
	A) Define MST, if there are 4 vertex and 5 edges in a graph then how many MST are possible?	**(2)**	**3**	**2**	**Applying**
	B) Explain Prim's algorithm for finding the Minimum Spanning Tree (MST) of a graph. Also Describe the steps involved in Prim's algorithm.	**(3)**	**2**	**2**	**Understanding**

	C)Construct the minimum spanning tree (MST) for the given graph using Kruskal's Algorithm 	**(3)**	**3**	**2**	**Applying**
Q.5	**Answer the following questions**.				
	A) Explain Strassen's algorithm for matrix multiplication and how it improves the efficiency compared to the conventional method.	**(6)**	**2**	**1**	**Understanding**
	B) What are the advantages and limitations of Strassen's algorithm?	**(2)**	**2**	**1**	**Understanding**
	Section-B (30 Marks)				
Q.6	**Objective Type Questions -** (All are compulsory and each of two marks)	**(6)**			
	1. Define DFS (Depth First Search).		**1**	**1**	**Remember**
	2. What is the time complexity of bubble sort in every case?		**1**	**1**	**Remember**
	3. Define the concept of backtracking.		**1**	**1**	**Remember**
Q.7	**Answer the following questions**.				
	A) Let A1, A2, A3, and A4 be four matrices of dimensions 10 x 15, 15 x 2, 2 x 3, and 3 x 5, respectively. The minimum number of scalar multiplications required to find the product A1A2A3A4 using the basic matrix multiplication method	**(4)**	**2**	**3**	**Understanding**
	B) Consider two strings *A ="qppqrr"* and *B ="pqpprqrp"*. What is length of LCS(longest common subsequence)? And how many strings are possible of max length?	**(4)**	**2**	**3**	**Understanding**
Q.8	**Answer the following questions**.				
	A) Let in a file the frequesncy of letters i, n, d, e,x are 16,7,17,25,20 respectively.What are the huffman's code of each letter?	**(4)**	**2**	**2**	**Understanding**
	B) Apply Quick sort algorithm and write Recurrence relation of quicksort on given numbers. **2, 7, 3, 9, 1, 6, 8, 4**	**(4)**	**2**	**2**	**Understanding**
Q.9	**Answer the following questions**.				
	A) Consider the following graph and write BFS , DFS traversal(Consider 0 as root node). 	**(3)**	**4**	**2,3**	**Analyzing**
	B) Consider the following directed weighted graph-	**(5)**	**4**	**2**	**Analyzing**

	 Using Floyd Warshall Algorithm, find the shortest path distance between every pair of vertices.				
Q.10	**Answer the following questions**.				
	A) How many queens are possible on 5*5 chess board and how ways are possible to place max queens on chess board?	**(3)**	**4**	**1**	**Analyzing**
	B) Suppose T = 1011101110, P = 111 Find all the Valid Shift Using The Naive String Matching Algorithm	**(3)**	**4**	**1**	**Analyzing**
	C) Differentiate NP hard and NP complete problems.	**(2)**	**5**	**1**	**Evaluating**