Algorithms Laboratory

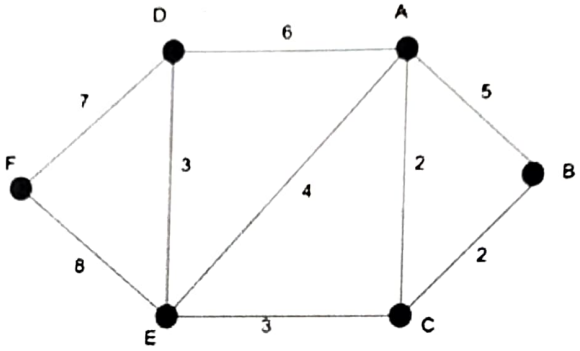
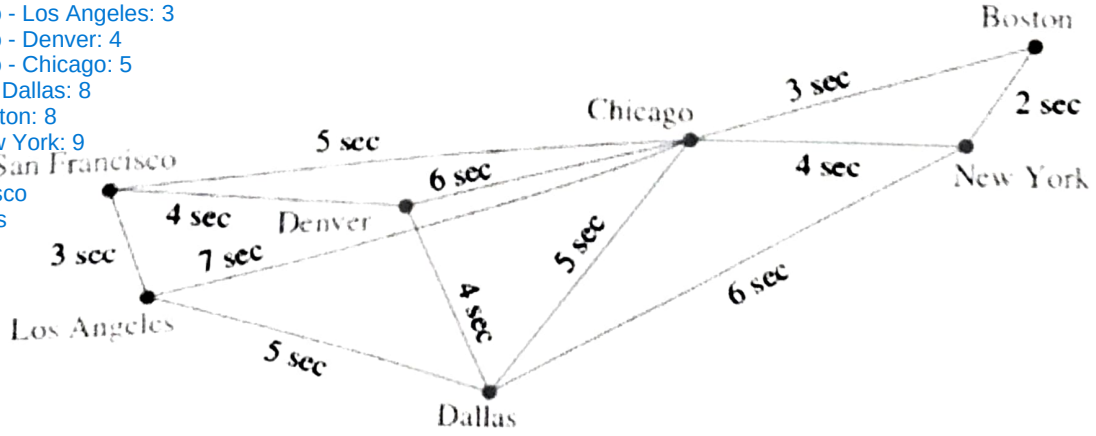
COUSE CODE:CIL47/ CYL47	COURSE COORDINATOR: Dr. SINI ANNA ALEX
CREDITS: 0:0:1	SEM: 4

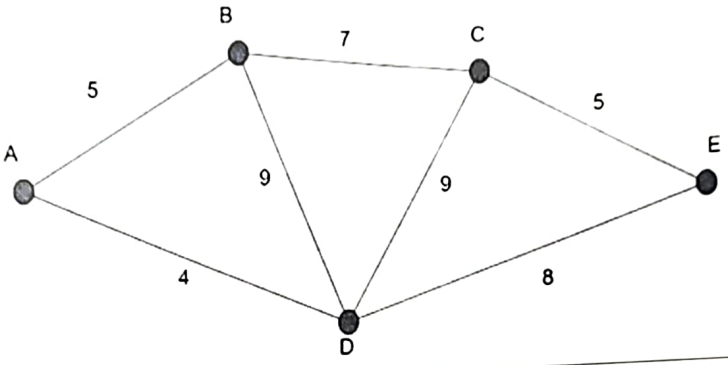
I.A. Marks: 50 | SEE Exam Hours: 03 | SEE Exam Marks: 50

Develop the following questions using C/C++/Java Programming Language and Execute

Sl. No.	List of Programs	CO	PO
	1243675		
	PART A		
1.	a. Design and Implement an algorithm for computing Greatest Common divisor (GCD) of 2 numbers, say m and n, using the following approaches. i. Middle school procedure ii. Euclid's Algorithm by Recursion iii. Consecutive Integer Checking Method Compute the Time Complexity for each and Display the GCD (m, n) where m>n.	1	1,2,3 ,9,10
2.	Design and Implement algorithm for searching techniques Linear Search and Binary Search(iterative/recursive). Compute the Time Complexity and Display.	1	1,2,3 ,9,10
3.	Consider the problem: You have a row of binary digits arranged randomly. Arrange them in such an order that all 0's precede all 1's or vice-versa. The only constraint in arranging them is that you are allowed to interchange the positions of binary digits if they are not similar. • Implement an algorithm for **Merge-sort** for binary value as input like **1 1 0 1 0 1 0 0 0**. • Compute the Time Complexity and Display the output as **0 0 0 0 0 1 1 1 1**.	1,2	1,2,3 ,9,10
4.	Design and Implement **a Quick Sort** algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from the user or can be generated using the random number generator.	1,2	1,2,3 ,9,10
5.	Design and Implement an algorithm to print all the nodes reachable from a given starting node in a graph using **Breadth First Search** (BFS). • Use Queue for constructing BFS spanning tree. • Display the BFS traversal order.	1,2	1,2,3 ,9,10
6.	Design and Implement an algorithm to check whether a given graph is connected or not using **Depth First Search** (DFS). • Use stack for constructing DFS spanning tree traversal. • Display the DFS traversal order.	1,2	1,2,3 ,9,10
7.	Design and Implement **Topological sort** algorithm for a directed graph (DAG) using anyone of the following approaches. i. **DFS-based** ii. **Source-removal**	1,2	1,2,3 ,9,10

PART B 3,6 || 1,2,5 || 4

1.	Pauline is a gardener and has created a sprinkler system in the diagram given in Fig. 1 b. Using **Prim's algorithm,** determine the network that connect all of the sprinklers with the least amount of piping and determine the total length of piping needed, by considering start vertex as **'F'.** Each vertex represents a sprinkler and the weight of each edge represents the distance in metres. 17  Fig. 1 b	1,2	1,2,3 ,9,10
2.	Design and Implement **Prim's algorithm** using Greedy Technique to display the minimum cost achieved considering the scenario given. A car driver is given a set of locations to be covered with their distances by a company. Now the company gives a privilege for the car driver to start at any arbitrary location. The constraint is entire driving route chosen by the driver should be minimum. Draw a graph satisfying the constraints and display the minimum spanning tree path and the minimum cost.	1,2	1,2,3 ,9,10
3.	Given a set of 4 items, each with a weight and a profit, and a knapsack with a maximum weight capacity **W=5,** select a subset of the items to include in the **knapsack**, such that the total weight of the selected items does not exceed W, and the total value of the selected items is maximized. 40 3 2 Weight | 1 | 2 | 3 | 2 Profit | 10 | 15 | 25 | 12	1,2 ,3	1,2,3 ,9,10
4.	Apply the **Dijkstra's algorithm** to find the length of shortest response time path between the San Francisco and New York in the graph given in Fig 4 b. For each step, show the values and the path of the shortest path. Find the shortest between the San Francisco and other cities. Compute and display the shortest length between the San Francisco and other cities. San Francisco - Los Angeles: 3 San Francisco - Denver: 4 San Francisco - Chicago: 5 Los Angeles - Dallas: 8 Chicago - Boston: 8 Chicago - New York: 9 Total: 37 0: San Francisco 1: Los Angeles 2: Denver 3: Chicago 4: Dallas 5: Boston 6: New York  Fig 4. b	1,2	1,2,3 ,9,10

5.	The management of a Kerry campsite wants to connect each mobile home with running water in the easiest way possible. Each mobile home is represented by a letter and the weight on each edge represents the distance between the mobile homes in metres. (i) Determine the Minimum Spanning Tree using **Prim's algorithm** so that every mobile home is connected to running water using the least length of piping. (ii) Calculate the total length of pipe needed with least length. 	1,2	1,2,3 ,9,10
6.	A thief wants to rob a store. He is carrying a bag of capacity W=8. The store has 4 objects. Its weight and value are given in the table 6 b. He can either include an item in its knapsack or exclude it but can't partially have it as a fraction. Find the maximum value of items that the thief can steal, applying dynamic programming technique. Table 6 b: **0/1 Knapsack Table** **OBJECT / WEIGHT / VALUE** 1 / 2 / 10 2 / 3 / 20 3 / 4 / 50 4 / 5 / 60  **Capacity=8**	1,2 ,3	1,2,3 ,9,10

Note:

- **Students are required to write Algorithm/ Pseudocode and analysis of the algorithm based on Time complexity.**

Marks Distribution:

Conduction and Result	Write-Up	Execution	Viva	Change of Program	Total
PART A	4	17	7	- 2 Marks	50 Marks
PART B	4	18		- 3 Marks	

Course coordinator

HoD

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