



QUESTION BANK FOR IV SEMESTER

Subject Code: CSL46

TERM: May–Aug 2023

I.A. Marks: 50

Subject Name: Design and Analysis of Algorithms Lab

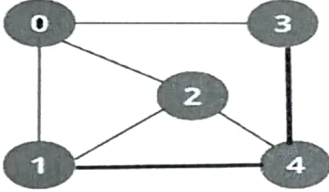
Exam Hours: 03

Credits: 0:0:1

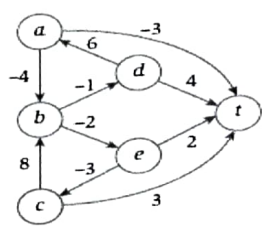
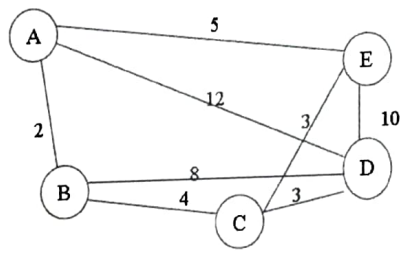
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Note:

- 1) Students must choose **one question** from **Part A** and **one question** from **Part B**. Algorithms for the same should be written
- 2) Programs should be implemented using **Python programming language**.
- 3) The **built-in modules should not be used** for implementation (except time module and random module)

PART - A		CO	PO
1.	Design and implement insertion sort algorithm to sort a set of numbers. Comment on the time complexity of the algorithm.	1	1,2,3,4,5,12
2.	Design and implement recursive DFS algorithm to determine the traversal of a graph. 	2	1,2,3,4,5,12
3.	Three users in an online music portal listen to a playlist of 8 songs that are numbered from 1 to 8 in a random order. Each user needs to be recommended to another user playlist's order that has minimum number of inversions. Design and implement an algorithm to determine the number of inversions. State the design strategy used and comment on the time complexity of the same.	2	1,2,3,4,5,12
4.	In a database of numbers there is a table of unsorted numbers. The database admin now wants to sort these numbers using an approach where in a pivot element is selected for sorting. At certain point, the first half elements are less than the pivot and right half elements are greater than the pivot. Design and implement Quicksort algorithm to solve it. State the design strategy used and comment on the time complexity of the same.	2	1,2,3,4,5,12
5.	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. But, the condition is the route chosen by the driver should be minimum i.e. the total cost of the entire driving should be minimum. Design and implement Prim's algorithm that gives a greedy solution to the car driver and display the minimum cost achieved. Find the time complexity.	2	1,2,3,4,5,12
6.	Given a set of non-negative integers and a value of variable sum. design and implement an algorithm to determine if there is a subset of the given set with a sum equal to the given sum. A suitable message is to be displayed if the given problem instance doesn't have a solution.	2	1,2,3,4,5,12

PART - B		CO	PO																												
1.	<p>Given a set of men's and women's preference list. Design and implement Gale-Shapley algorithm to determine the stable set of marriages among them. Comment on the time complexity of the same.</p> <p>Assumptions: Men propose first according to their preference list. Women can choose a better partner based on the preference.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Men's preference list</p> <table border="1"> <tr><td>A</td><td>V</td><td>W</td><td>X</td></tr> <tr><td>B</td><td>W</td><td>V</td><td>X</td></tr> <tr><td>C</td><td>V</td><td>W</td><td>X</td></tr> </table> </div> <div style="text-align: center;"> <p>Women's preference list</p> <table border="1"> <tr><td>V</td><td>A</td><td>B</td><td>C</td></tr> <tr><td>W</td><td>B</td><td>C</td><td>A</td></tr> <tr><td>X</td><td>C</td><td>A</td><td>B</td></tr> </table> </div> </div>	A	V	W	X	B	W	V	X	C	V	W	X	V	A	B	C	W	B	C	A	X	C	A	B	1	1,2,3,4,5,12				
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2.	Design and implement merge sort algorithm that takes random number input and displays the execution time required. State the design strategy used and comment on the time complexity of the same.	2	1,2,3,4,5,12																												
3.	<p>A truck driver is given a set of locations to be covered with their distances by a company. The company strictly orders that truck should be started from a particular location. Design and implement Dijkstra's algorithm that gives a greedy solution to the truck driver's problem and display the shortest path for a given source location to all other locations. State the design strategy used and comment on the time complexity of the same.</p>	2	1,2,3,4,5,12																												
4.	<p>A phone company wants to lay lines for communication in a city. Different amounts are charged for connecting between each pair of cities. Design and implement Kruskal's greedy solution such that it forms a spanning tree with minimum cost and find the time complexity of the same.</p>	2	1,2,3,4,5,12																												
5.	<p>A drama venue needs to be allocated for different drama school requests such that maximum profit is obtained for the company owning the drama venue. The requests are shown in the table with start-time, finish-time and the amount affordable by the drama school. Design and implement Weighted Interval Scheduling algorithm such that maximum profit is obtained for the company owning the drama venue using Dynamic programming principles. State the design strategy used and comment on the time complexity of the same.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Drama School</th><th>Start-time</th><th>Finish-time</th><th>Value</th></tr> </thead> <tbody> <tr><td>1</td><td>1</td><td>2</td><td>100</td></tr> <tr><td>2</td><td>2</td><td>5</td><td>200</td></tr> <tr><td>3</td><td>3</td><td>6</td><td>300</td></tr> <tr><td>4</td><td>4</td><td>8</td><td>400</td></tr> <tr><td>5</td><td>5</td><td>9</td><td>500</td></tr> <tr><td>6</td><td>6</td><td>10</td><td>100</td></tr> </tbody> </table>	Drama School	Start-time	Finish-time	Value	1	1	2	100	2	2	5	200	3	3	6	300	4	4	8	400	5	5	9	500	6	6	10	100	2	1,2,3,4,5,12
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6.	Alia is planning for a trekking expedition with a backpack that can hold 7kg. She needs to select the most valuable items from the following list that can be accommodated within the backpack. Design and implement Knapsack algorithm that displays the most valuable items that can be carried by her using Dynamic programming principles and find the time complexity of the same.	2	1,2,3,4,5,12															
	<table border="1"><thead><tr><th>Items</th><th>Weight</th><th>Value</th></tr></thead><tbody><tr><td>1</td><td>3</td><td>10</td></tr><tr><td>2</td><td>5</td><td>4</td></tr><tr><td>3</td><td>6</td><td>9</td></tr><tr><td>4</td><td>2</td><td>11</td></tr></tbody></table>	Items	Weight	Value	1	3	10	2	5	4	3	6	9	4	2	11		
Items	Weight	Value																
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7.	Design and implement Bellman ford algorithm to find the shortest path from a given source to all other nodes. State the design strategy used and comment on the time complexity of the same.	2	1,2,3,4,5,12															
																		
8.	Design and implement N-queens algorithm that displays the possible solutions on 4 x 4 chessboard. State the design strategy used and time complexity of the same.	3	1,2,3,4,5,12															
9.	Design and implement an algorithm for Travelling salesman problem	3	1,2,3,4,5,12															
																		

Marks Distribution:

	Write-Up (8)	Execution (35)	Viva	Change of Program	Total
Part - A	4	15	7	-2 Marks	50 Marks
Part - B	4	20		-3 Marks	

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7/18/23.
Dr. Parkari.
Dept of CSE, RIT.

Handwritten signature
HOD CSE
Professor & Head
Dept. of Computer Science and Engg.
Ramiah Institute of Technology
(Autonomous Institute, Affiliated to VTU)
Bangalore - 560 054
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