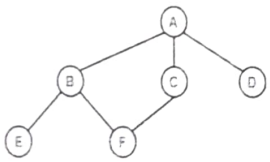
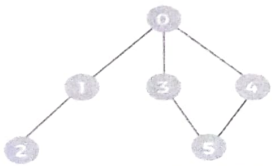
RAMAIAH
Institute of Technology

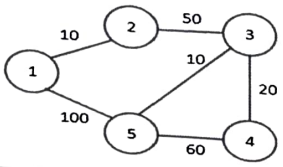
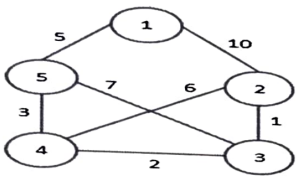
Department of Computer Science & Engineering

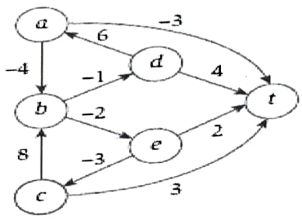
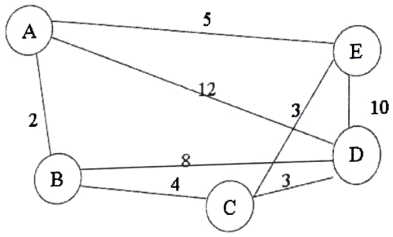
QUESTION BANK FOR IV SEMESTER

Subject Code: CSL46 **TERM: April–July 2024** **I.A. Marks: 50**
Subject Name: Design and Analysis of Algorithms Laboratory **Exam Hours: 03**
Credits: 0:0:1 **Exam Marks: 50**

Note:
1) Students must choose **one question** from the lot. Algorithms for the same should be written
2) Programs should be implemented using **Python programming language** for user defined inputs [**no hard coding**]
3) The **built-in modules should not be used** for implementation (except time module and random module)

	Lab Programs	CO	PO
1.	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. Find the time complexity of the same. **Assumptions:** Men propose first according to their preference list. Women can choose a better partner based on the preference. **Men's preference list** **A** V W X **B** W V X **C** V W X **Women's preference list** **V** A B C **W** B C A **X** C A B	1	1,2,3,4,5,12
2.	Design and implement recursive **DFS algorithm** to determine the traversal of a graph from any arbitrary source node. Find the running time of the algorithm. 	2	1,2,3,4,5,12
3.	Design and implement **BFS algorithm** to determine the traversal of a graph from any arbitrary source node. Find the running time of the algorithm. 	2	1,2,3,4,5,12
4.	Design and implement **merge sort algorithm**. State the design strategy used and find the time complexity of the same.	2	1,2,3,4,5,12
5.	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 **counting inversion algorithm**. State the design strategy used and find the time complexity of the same.	2	1,2,3,4,5,12

6.	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 the first element is selected as the pivot element 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 find the time complexity of the same	2	1,2,3,4,5,12
7.	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 find the time complexity of the same.  	2	1,2,3,4,5,12
8.	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
9.	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.  	2	1,2,3,4,5,12
10.	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 find the time complexity of the same. **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
11.	Given a set of non-negative integers and a value of variable sum. design and implement **Subset Sum** algorithm to determine if there is a subset of the given	2	1,2,3,4,5,12

	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.		
12.	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 principle and find the time complexity of the same. **Items** / **Weight** / **Value** 1 / 3 / 10 2 / 5 / 4 3 / 6 / 9 4 / 2 / 11	2	1,2,3,4,5,12
13.	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 find the time complexity of the same. 	2	1,2,3,4,5,12
14.	Design and implement **N-queens algorithm** that displays the possible solutions on 4 x 4 chessboard. State the design strategy used and find the time complexity of the same.	3	1,2,3,4,5,12
15.	Design and implement an algorithm for **Travelling Salesman Problem** using backtracking technique. 	3	1,2,3,4,5,12

Marks Distribution:

Write-Up	Algorithm Implementation and Execution	Viva	Change of Program
8 Marks	35 Marks	7 Marks	-5 Marks

25/7/2024

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HOD CSE

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