

Test: CLAT-3

Course Code & Title: 21CSC201J & Data Structures and Algorithms

Year & Sem: II/III

Date: 05.11.2024

Duration: 90 min.

Max. Marks: 50

Course Articulation Matrix:

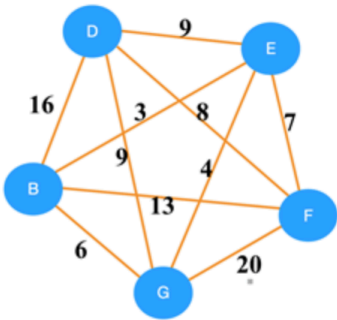
S. No	Course Outcomes (CO)	Program Outcomes (PO)												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Develop programs using data types like structures, pointers and arrays supported by C programming language	1	-	3	-	-	-	-	-	2	-	-	-	1	-	2
2	Analyze the complexity of algorithm and if needed, modify it to improve its efficiency	2	3	2	1	-	-	-	-	-	-	-	-	1	2	-
3	Identify and use appropriate data structure for devising solution	1	3	2	-	-	-	-	-	-	-	-	-	1	1	2
4	Describe and use tree structure while developing programs	2	-	3	2	-	-	-	-	-	-	-	-	1	-	2
5	Implement the Graph structure and use it whenever deemed university for provide	3	2	3	-	-	-	-	-	-	-	-	-	1	1	2

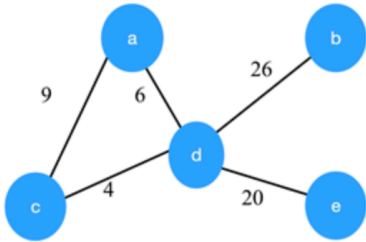
Part – A

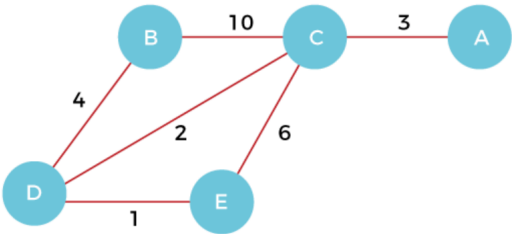
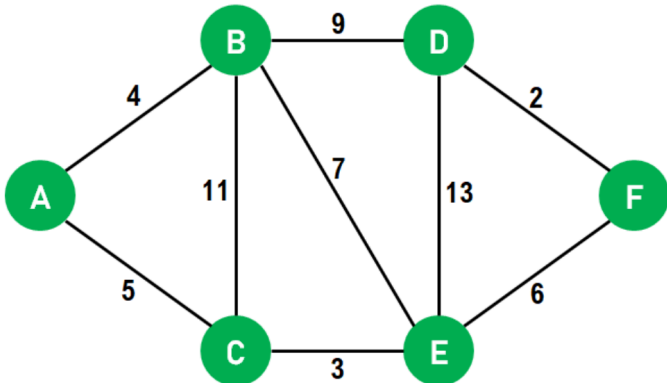
(11 x 01 = 11 Marks)

Instructions: Answer All the Questions

Q. No	Question	Marks	BL	CO	PO
1	The number of edges from the node to the deepest leaf is called _____ of the tree. a) Height b) Depth c) Length d) Width	1	1	2	2
2	What is a complete binary tree? a) Each node has exactly zero or two children b) A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from right to left c) A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from left to right d) A tree In which all nodes have degree 2	1	1	2	2
3	Which of the following is false about a binary search tree? a) The left child is always lesser than its parent b) The right child is always greater than its parent c) The left and right sub-trees should also be binary search trees d) In order sequence gives decreasing order of elements	1	1	2	2

4	<p>What are the worst case and average case complexities of a binary search tree?</p> <p>a) $O(n)$, $O(n)$</p> <p>b) $O(\log n)$, $O(\log n)$</p> <p>c) $O(\log n)$, $O(n)$</p> <p>d) $O(n)$, $O(\log n)$</p>	1	1	2	1
5	<p>The maximum possible height of an AVL Tree with 7 nodes is</p> <p>a) 3 b) 4 c) 5 d) 6</p>	1	2	3	1
6	<p>What is a hash function?</p> <p>(a) A function has allocated memory to keys</p> <p>(b) A function that computes the location of the key in the array</p> <p>(c) A function that creates an array</p>	1	1	3	2
7	<p>Consider the following graph. Using Kruskal's algorithm, which edge will be selected first?</p>  <p>a) GF b) DE c) BE d) BG</p>	1	3	3	1
8	<p>The traveling salesman problem can be solved using _____</p> <p>a) A spanning tree</p> <p>b) A minimum spanning tree</p> <p>c) Bellman – Ford algorithm</p> <p>d) DFS traversal</p>	1	1	3	2
9	<p>Consider the graph M with 3 vertices. Its adjacency matrix is shown below. Which of the following is true?</p> $M = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ <p>a) Graph M has no minimum spanning tree</p> <p>b) Graph M has a unique minimum spanning trees of cost 2</p> <p>c) Graph M has 3 distinct minimum spanning trees, each of cost 2</p> <p>d) Graph M has 3 spanning trees of different costs</p>	1	2	3	2

10	<p>Consider the graph shown below. Which of the following are the edges in the MST of the given graph</p>  <p>a) (a-c)(c-d)(d-b)(d-b) b) (c-a)(a-d)(d-b)(d-e) c) (a-d)(d-c)(d-b)(d-e) d) (c-a)(a-d)(d-c)(d-b)(d-e)</p>	1	2	3	1
11	<p>Dijkstra's Algorithm is used to solve _____ problems.</p> <p>a) Single source shortest path b) All pair shortest path c) Sorting d) Network flow</p>	1	1	2	1
<p style="text-align: center;">Part – B (3 * 8 =24 Marks) Instructions: Answer All the Questions</p>					
12. A	<p>Explain linear probing technique for handling collisions and employ the same for creating the hash table for the keys, 13, 1, 6, 11 and 10. Use M as 5. Discuss the complexity of storing and retrieving data in a hash table.</p>	8	2	3	1
OR					
12. B	<p>(i) Consider the keys 8, 10, 14, 3, 6, 13, 1, 4 and 7. Construct a Binary Search Tree (BST) by inserting the keys in the same order. (ii) Write the output for In-order and Pre-order traversal.</p>	8	2	3	1
13. A	<p>Explain Single and Double rotations in AVL tree with suitable examples.</p>	8	3	2	2
OR					
13. B	<p>Construct a 3-way B-Tree by inserting the following data elements, 7, 8, 9, 10, 11, 16, 21, and 18.</p>	8	3	2	3

14. A	 <p>Consider the above graph, construct a Minimum Spanning Tree and calculate the minimal cost by using Krushkal's algorithm.</p>	8	3	3	3
OR					
14. B	Illustrate how stacks are employed for graph traversals.	8	2	3	3
Part –C (1 * 15 =15 Marks) Instructions: Answer ANY ONE out of TWO					
15.	<p>Given input {4371,1323,6173,4199,4344,9679,1989} and a hash function $h(X) = X \pmod{10}$, show the resulting:</p> <p>a. Separate chaining hash table.</p> <p>b. Open addressing hash table using linear probing.</p> <p>c. Open addressing hash table using Quadratic probing.</p>	15	3	3	3
16.	 <p>Given a weighted graph and a source vertex in the graph, find the shortest paths from the source to all the other vertices in the given graph. Source: A.</p>	15	3	3	3

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions

