PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 20-05-2025 **Time:** 01:00 pm – 04:00 pm

School: SOIS	Program: BCA/BCADS/BCAAIML
Course Code: CSA2101	Course Name: Data Structures and Algorithms
Semester: II	Max Marks: 100 / Weightage: 50%

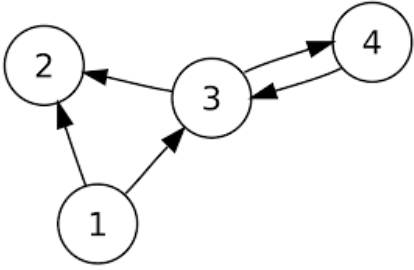| CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	24	24	26	26	-

Instructions:

(i) Read all questions carefully and answer accordingly.
(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	A linear queue has size of 5 and has 3 elements 11, 30, 41 where F=0 and R=2. After inserting 50 and 60, what is the value of F and R. Trying to insert 33, at this stage what happens?	2 Marks	L3	CO1
2.	Recall when the overflow and underflow condition occur during stack operations.	2 Marks	L1	CO1
3.	Define doubly linked list. What is its advantage?	2 Marks	L1	CO2
4.	Outline the applications of linked list.	2 Marks	L1	CO2

5.	Define full binary tree. Is the tree given below a full binary tree?
	
	`    A`
	`   / \`
	`  B   C`
	` /\  /\`
	`D  E F  G`
		2 Marks	L1	CO3

6.	Indicate the properties of binary tree.	2 Marks	L2	CO3

7.	Write the adjacency matrix for following graph.	2 Marks	L1	CO3
8.	What is meant by searching? List its types.	2 Marks	L1	CO4
9.	Distinguish between selection sort and insertion sort.	2 Marks	L4	CO4
10.	What is time complexity?	2 Marks	L1	CO4

Part B

Answer the Questions.   **Total Marks 80M**

11.	a.	What is an array? List the various types of array. How the arrays are initialized and accessed? Elaborate two dimensional array with example program.	20 Marks	L1	CO1
		Or			
12.	a.	Write and explain the enqueue and dequeue operations of a queue. Also, explain in detail the different types of queues.	20 Marks	L2	CO1

13.	a.	What are the advantages of linked list over arrays? Give a structure of a singly linked list. What is the disadvantage of a singly linked list? How is it overcome? Write an algorithm to insert a node in the single linked list with example.	20 Marks	L1	CO2
		Or			
14.	a.	Define recursion. Write the difference between recursion and iteration. Implement a recursive function in C to compute the factorial of a given number. Explain how recursion works using a recursion tree for input n = 5.	20 Marks	L1	CO2

15.	a.	Explain, step by step, how to construct a Binary Search Tree (BST) from the values {20, 30, 10, 50, −20, −30, 60}. After building the BST, insert the key 75, and provide an algorithm for inserting a node into a BST.	20 Marks	L2	CO3
		Or			
16.	a.	Explain the algorithm for binary tree traversals. Explain, step by step, how to construct a Binary Search Tree (BST) from the	20 Marks	L2	CO3

		values {45,26,10,60,70,30,0} then traverse the constructed BST using in-order, pre-order and post-order techniques.			

17.	a.	A teacher wants to arrange the scores of 8 students in increasing order. The scores are as follows: [58, 72, 45, 89, 32, 64, 71, 50]
		
		The teacher uses **Insertion Sort** to sort the scores.
		
		    i) What is the first step in the Insertion Sort algorithm?
		    ii) Describe how the array will look after the first pass of Insertion Sort.
		    iii) Sort the scores in ascending order using the Insertion Sort algorithm. Show the array after each pass.
		    iv) Write the Insertion Sort algorithm.
			20 Marks	L2	CO4

		Or			

18.	a.	A gaming leaderboard stores 8 players' scores in ascending order so it can rank them quickly:
		
		[114, 127, 133, 145,158, 169, 174, 188].
		
		A programmer must choose between two search methods for finding a particular score:
		
		  • **Method A** checks each score from left to right until it finds the target.
		  • **Method B** keeps the list sorted and, during a search, repeatedly halves the range it still needs to inspect.
		
		  i) Give the formal algorithm names for **Method A** and **Method B**.
		  ii) Using the sorted list above, apply **Method B** to search for the score 158. Show the low, high, and mid indices (or values) at every comparison until the score is found.
		  iii) Write the algorithm for **Method B**.
		  iv) State one key difference related to data ordering and one difference in worst-case time-complexity between these two methods.
			20 Marks	L2	CO4