PARUL UNIVERSITY
FACULTY OF IT & COMPUTER SCIENCE
MCA(A.Y.-II)/ M.Sc.(IT) Winter 2024-25 Examination

Date: 23-12-2024
Time: 2:00 PM TO 4:30 PM
Total Marks: 60

Semester: I
Subject Code: 05201151 / 05202112
Subject Name: Data Structures /Data Structures & Algorithms

Instructions:
1. All questions are compulsory.
2. Make suitable assumptions whenever necessary.
3. Write the answers for both sections on separate answer sheets.

SECTION - A [30 Marks]		[20]	CO	BT
Q1	Answer the following questions:			
(a)	Answer **all** questions	(5)		
i.	Key Word In Context (KWIC) indexing is used for: (A) Text retrieval (B) Sorting algorithms (C) Memory allocation (D) Arithmetic operations	1	CO1	BT1
ii.	Which type of queue allows insertion and deletion at both ends? (A) Simple Queue (B) Circular Queue (C) Double Ended Queue (Deque) (D) Priority Queue	1	CO1	BT2
iii.	What are some real-world applications of stacks?	1	CO1	BT2
iv.	True or False: The depth of a node is the same as its height in a tree.	1	CO3	BT2
v.	True or False: A complete binary tree is always a full binary tree.	1	CO3	BT2
(b)	Attempt Any **Five** Questions out of Seven	(15)		
i.	Describe the storage structure of one-dimensional arrays in memory.	3	CO1	BT2
ii.	What challenges might arise when implementing KWIC indexing for multilingual text?	3	CO1	BT4
iii.	List common applications of queues in real-world scenarios.	3	CO1	BT3
iv.	Discuss the significance of the stack data structure in implementing arithmetic expression evaluations.	3	CO1	BT2
v.	How do you determine the balance factor of a node in an AVL tree?	3	CO3	BT3
vi.	What are the different cases to consider when deleting a node from a BST?	3	CO3	BT4
vii.	What are the advantages and complications of implementing tree structures in memory?	3	CO3	BT4
Q2	Answer/Solve following in detail (Attempt any 2 out of 3)	[10]		
(a)	What is the difference between time complexity and space complexity?	5	CO1	BT5
(b)	Explain the Last In, First Out (LIFO) principle in the context of stack operations.	5	CO1	BT4
(c)	Compare the efficiency of tree traversal methods: preorder, inorder, and postorder.	5	CO3	BT5

SECTION - B [30 Marks]		[20]	CO	BT
Q1	Answer the following questions:			
(a)	Answer **all** questions	(5)		
i.	Which of the following sorting algorithms is the fastest in the average case? (A) Bubble Sort (B) Insertion Sort (C) Quick Sort (D) Selection Sort	1	CO4	BT2

ii. Linked lists are used to implement which of the following? (A) Arrays (B) Hashing (C) Stacks (D) Graphs	1	CO2	BT1
iii. Write operations on Linkedlist	1	CO2	BT1
iv. Define a weighted graph.	1	CO4	BT2
v. What is the primary advantage of merge sort?	1	CO4	BT2
(b) Attempt Any **Five** Questions out of Seven	(15)		
i. What are the advantages of using circular linked lists in applications	3	CO2	BT2
ii. What is polynomial representation using linked lists?	3	CO2	BT2
iii. Explain the significance of graphs in real-world applications.	3	CO4	BT4
iv. In what scenarios would you prefer linear search over binary search?	3	CO4	BT4
v. What are the best-case and worst-case time complexities for selection sort?	3	CO4	BT2
vi. What is the difference between a spanning tree and a minimum spanning tree?	3	CO4	BT4
vii. What are the advantages of using linked lists over arrays?	3	CO2	BT4
Q2 Answer/Solve following in detail (Attempt any 2 out of 3)	[10]		
(a) What is hashing, and how is it used in data structures like hash tables?	5	CO4	BT5
(b) Compare DFS and BFS in terms of time and space complexity.	5	CO4	BT5
(c) Create a visualization of how Radix Sort processes a set of numbers.	5	CO4	BT6