

Enrollment No.....



Faculty of Engineering
End Sem Examination May-2024
CB3CO21 Data Structures & Algorithms
Programme: B.Tech. Branch/Specialisation: CSBS

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. In recursion, the condition for which the function will stop calling itself is _____. **1**
 (a) Best case (b) Worst case
 (c) Base case (d) There is no such condition
- ii. _____ is the formal way to express the upper bound of an algorithm's running time. **1**
 (a) Omega Notation (b) Theta Notation
 (c) Big Oh Notation (d) All of these
- iii. In linked list each node contains a minimum of two fields. One field is data field to store the data and second field is- **1**
 (a) Pointer to character (b) Pointer to integer
 (c) Pointer to node (d) Node
- iv. Identify the data structure which allows deletions at both ends of the list but insertion at only one end- **1**
 (a) Input restricted deque (b) Output restricted queue
 (c) Priority queues (d) Stack
- v. A binary search tree whose left subtree and right subtree differ in height by at most 1 unit is called _____. **1**
 (a) Lemma tree (b) Redblack tree
 (c) AVL tree (d) None of these
- vi. A Binary tree can have- **1**
 (a) 2 children (b) 1 children
 (c) 0 children (d) All of these

[2]

- vii. Which of the following is an advantage of adjacency list representation over adjacency matrix representation of a graph? **1**
 (a) In adjacency list representation, space is saved for sparse graphs.
 (b) DFS and BSF can be done in $O(V + E)$ time for adjacency list representation. These operations take $O(V^2)$ time in adjacency matrix representation. Here V and E are number of vertices and edges respectively.
 (c) Adding a vertex in adjacency list representation is easier than adjacency matrix representation.
 (d) All of these
- viii. In the _____ traversal we process all of a vertex's descendants before we move to an adjacent vertex. **1**
 (a) Depth-First (b) Breadth-First
 (c) With-First (d) Depth Limited
- ix. What is the search complexity in direct addressing? **1**
 (a) $O(n)$ (b) $O(\log n)$ (c) $O(n \log n)$ (d) $O(1)$
- x. If the number of records to be sorted is small, then _____ sorting can be efficient. **1**
 (a) Merge (b) Heap (c) Selection (d) Bubble
- Q.2 i. What do you mean by recursion? Explain the implementation of factorial with example using recursion. **4**
 ii. Inspect, why do we need an asymptotic notation. Explain the different asymptotic notations with definition and example. **6**
- OR iii. Define an algorithm. List out and discuss the sequence of steps needed to design and analyze an algorithm. **6**
- Q.3 i. What are the advantage of linked list over array? **2**
 ii. Consider a two-dimensional array $A[20][10]$. Assume 4 words per memory cell, the base address of array A is 100, elements are stored in row-major order and first element is $A[0][0]$. What is the address of $A[11][5]$? **3**
 iii. State the steps and convert the following expression from infix to postfix notation: **5**
 $R/D - Y * (G/C * (D - E) + B/Z) + S * A$
- OR iv. What is the advantage of circular queue over ordinary queue? Write an algorithm to implement insertion operation in circular queue. **5**

[3]

- Q.4 i. The inorder and preorder traversal of a tree are given below: **3**
 Inorder: DBMINEAFCJGK
 Preorder: ABDEIMNCFGJK
 (a) Construct the corresponding binary tree
 (b) Determine the postorder traversal of the tree drawn
- ii. Show the result of inserting H, I, J, B, A, E, C, F, D, G, K, L into an initially empty AVL Tree. Specify the type of rotation after each insertion. **7**
- OR iii. Explain B Tree and B+ Tree in detail. **7**
- Q.5 i. Define the term graph. With the help of suitable example give adjacency matrix representation and adjacency list representation of the graph. **4**
 ii. Explain graph traversals with illustrative example. **6**
- OR iii. Explain file organization in detail. **6**
- Q.6 Attempt any two:
 i. Explain binary search with example. What are the advantage of binary search over linear search? **5**
 ii. Rearrange following numbers using quick sort: **5**
 10,6,3,7,17,26,56,32,72
 iii. Define hashing, hash function and hash table with example. **5**

Marking Scheme

Data Structure and Algorithms CB3CO21

Q.1	i)	c) Base case	1
	ii)	c) Big Oh Notation	1
	iii)	c) pointer to node	1
	iv)	a) Input restricted deque	1
	v)	c) AVL tree	1
	vi)	d) All of the above	1
	vii)	d) All of the above	1
	viii)	(a) Depth-First	1
	ix)	d) O(1)	1
	x)	c) Selection	1
Q.2	i.	What do you mean by recursion? Explain the implementation of factorial with example using recursion?	
		Definition	1 Marks
		Implementation	2 Marks
		Example	1 Marks
	ii.	Inspect, why do we need an Asymptotic notation. Explain the different Asymptotic notations with definition and example.	6
OR	iii.	Define an algorithm. List out and discuss the sequence of steps needed to design and analyze an algorithm.	
		Definition	2 Marks
		Steps	4 Marks
			6
	Q.3	i.	
		What are the advantage of linked list over array?	
		Each advantage	0.5 Mark
		ii.	
		Consider a two dimensional array A[20][10]. Assume 4 words per memory cell, the base address of array A is 100, elements are stored in row-major order and first element is A[0][0]. What is the address of A[11][5] ?	3
	iii.	State the steps and convert the following expression from infix to postfix notation: R/D-Y*(G/C*(D-E)+B/Z)+S*A	5

OR	iv.	Step Marking	
		What is the advantage of circular queue over ordinary queue. Also Write an algorithm to implement insertion operation in circular queue?	5
		advantage of circular queue	2 Marks
Q.4	i.	algorithm	3 Marks
		The inorder and preorder traversal of a tree are given below: Inorder: DBMINEAFCJGK Preorder: ABDEIMNCFGJK	3
		i) construct the corresponding binary tree	1.5 Marks
		ii) determine the postorder traversal of the tree drawn	1.5 Marks
	ii.	Show the result of inserting H , I ,J ,B , A ,E ,C , F , D , G , K , L into an initially empty AVL Tree .Specify the type of rotation after each insertion.	7
OR	iii.	Step Marking	
		Explain B Tree and B+ Tree in details?	
		B Tree	3.5 Marks
		B+ Tree	3.5 Marks
Q.5	i.	Define the term Graph. With the help of suitable example give adjacency matrix representation and adjacency list representation of the graph.	
		Definition	1 Marks
		adjacency matrix representation	1.5 Marks
		adjacency list representation	1.5 Marks
	ii.	Explain graph traversals with illustrative example. BFS with example DFS with example	6
OR	iii.	Explain file organization in details?	
		Each type	1.5 Marks
Q.6	i.	Attempt any two:	
		Explain binary search with example ?What are the advantage of binary search over linear search.	
		Definition	2 Marks
		Example	2 Marks
		Advantage	1 Mark
	ii.	Rearrange following numbers using Quick sort: 10,6,3,7,17,26,56,32,72	5
		Step marking	

[2]

[3]

- iii. Define hashing,hash function and hash table with example?
Hashing 2 Marks
hash function 1 Marks
hash table 1 Marks
example 1 Marks

5

|