Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2022

CB3CO01 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.

Q.1 i. The two main measures for the efficiency of an algorithm are- **1**
(a) Processor and memory (b) Complexity and capacity
(c) Time and space (d) Data and space

ii. Which data structure allows deleting data elements from front and inserting at rear? **1**
(a) Stack (b) Queue (c) Dequeue (d) Binary search tree

iii. Which of the following data structure is linear type? **1**
(a) Strings (b) Queue (c) List (d) All of these

iv. An algorithm that calls itself directly or indirectly is known as- **1**
(a) Sub algorithm (b) Recursion
(c) Polish notation (d) Traversal algorithm

v. A binary tree whose every node has either zero or two children is called- **1**
(a) Complete binary tree (b) Binary search tree
(c) Extended binary tree (d) None of these

vi. A binary search tree whose left subtree and right subtree differ in height by at most 1 unit is called- **1**
(a) AVL tree (b) Redblack tree
(c) Lemma Tree (d) None of these

vii. In a graph if any edge e = [u, v], then u and v are called- **1**
(a) Endpoints of e (b) Adjacent nodes
(c) Neighbours (d) All of these

viii. A directed graph is _____ if there is a path from each vertex to every other vertex in the digraph. **1**
(a) Weakly connected (b) Strongly connected
(c) Tightly connected (d) Linearly connected

ix. Which of the following is not the internal sort? **1**
(a) Insertion sort (b) Merge sort
(c) Bubble sort (d) Heap sort

x. What is the maximum number of swaps that can be performed in the Selection Sort algorithm? **1**
(a) N-1 (b) N (c) 1 (d) N-2

Q.2 i. Compare structured approach and object-oriented approach of programming. **2**

ii. Define Big Oh, Big Omega and Big Theta Notations. **3**

iii. What do you understand by complexity of an algorithm? Explain linear search algorithm with its worst case and best case complexity. **5**

OR iv. What is stepwise refinement technique? Explain with an example. **5**

Q.3 i. What are the advantages of linked list over arrays? **2**

ii. Explain linear data structure with examples. **3**

iii. What is stack? Write algorithm for operations of stack with examples. **5**

OR iv. Define recursive function. Also write a recursive function to find the factorial of a given number with its time complexity. What are the essential conditions to be satisfied by a recursive function? **5**

Q.4 Attempt any two:

i. What is a binary search tree (BST)? Give an example of a BST with five nodes. **5**

ii. Write the Non recursive Preorder, Inorder traversal algorithm. **5**

iii. Describe insertion, deletion and searching operations on AVL trees. **5**

Q.5 i. Describe any four file organization techniques. **4**

ii. Write algorithms for DFS and BFS traversal on a graph. **6**

OR iii. Explain the various representation of graph with example in detail. **6**

Q.6 Write short note on any two:

i. Hashing **5**

ii. Quick Sort **5**

iii. Merge Sort **5**

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Marking Scheme
CB3CO01 Data Structures & Algorithms

Q.1	i.	The two main measures for the efficiency of an algorithm are- (c) Time and space		**1**
	ii.	Which data structure allows deleting data elements from front and inserting at rear? (b) Queue		**1**
	iii.	Which of the following data structure is linear type? (d) All of these		**1**
	iv.	An algorithm that calls itself directly or indirectly is known as- (b) Recursion		**1**
	v.	A binary tree whose every node has either zero or two children is called- (c) Extended binary tree		**1**
	vi.	A binary search tree whose left subtree and right subtree differ in height by at most 1 unit is called- (a) AVL tree		**1**
	vii.	In a graph if any edge e = [u, v], then u and v are called- (d) All of these		**1**
	viii.	A directed graph is _____ if there is a path from each vertex to every other vertex in the digraph. (b) Strongly connected		**1**
	ix.	Which of the following is not the internal sort? (b) Merge sort		**1**
	x.	What is the maximum number of swaps that can be performed in the Selection Sort algorithm? (a) N-1		**1**

Q.2	i.	Any two comparison	(1 mark * 2)	**2**
	ii.	Big Oh, Big Omega, Big Theta Notations	(1 mark each)	**3**
	iii.	Complexity of an algorithm	2 marks	**5**
		Worst case complexity	1.5 marks	
		Best case complexity	1.5 marks	
OR	iv.	Stepwise refinement technique	4 marks	**5**
		Example	1 mark	
Q.3	i.	Any two point	(1 mark * 2)	**2**
	ii.	Linear data structure	2 marks	**3**
		Examples	1 mark	
	iii.	Stack	2 marks	**5**
		Push Operation	1.5 mark	
		Pop Operation	1.5 mark	
OR	iv.	Recursive function	1 mark	**5**
		Recursive function to find the factorial	2 marks	
		Its time complexity	1 mark	
		Essential conditions	1 mark	
Q.4		Attempt any two:		
	i.	Binary search tree (BST)	2.5 marks	**5**
		Example of a BST with five nodes	2.5 marks	
	ii.	Non recursive Preorder traversal algorithm	2.5 marks	**5**
		Non recursive Inorder traversal algorithm	2.5 marks	
	iii.	Insertion operation	2 marks	**5**
		Deletion operation	2 marks	
		Searching operations	1 mark	
Q.5	i.	Any four file organization techniques	(1 mark * 4)	**4**
	ii.	DFS traversal	3 marks	**6**
		BFS traversal	3 marks	
OR	iii.	Graph types	3 marks	**6**
		Example	3 marks	
Q.6		Write short note on any two:		
	i.	Hashing	5 marks	**5**
	ii.	Quick Sort	5 marks	**5**
	iii.	Merge Sort	5 marks	**5**

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