Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 3130702   **Date: 28/11/2019**
Subject Name: Data Structures
Time: 02:30 PM TO 05:00 PM   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Discuss various types of data structures with example.	**03**
	(b)	What is hash function used for? Give one example of a hash function.	**04**
	(c)	What is time and space analysis? State and explain time analysis for linear search and binary search method.	**07**
Q.2	**(a)**	Compare Array and Link list.	**03**
	(b)	State disadvantages of simple queue. How to overcome it?	**04**
	(c)	Write an algorithm for INSERT, DELETE and DISPLAY function of Circular Queue.	**07**

OR

	(c)	Write an algorithm for INSERT operation to insert a node at a given position in a Link list.	**07**
Q.3	**(a)**	Discuss height balance tree.	**03**
	(b)	Discuss Minimal Spanning Tree.	**04**
	(c)	Write a recursive function to compute factorial of a number. Show usage of STACK in recursion for this function.	**07**

OR

Q.3	**(a)**	Write an algorithm to find length of a simple link list.	**03**
	(b)	Write an algorithm to insert a node in a Circular Link List at the FIRST position.	**04**
	(c)	Write an algorithm for DELETE operation in a Binary search tree.	**07**
Q.4	**(a)**	Discuss Threaded Binary Tree.	**03**
	(b)	Write an algorithm for a non recursive (Iterative) pre order traversal of Binary search tree.	**04**
	(c)	Create an AVL tree for the following sequence of numbers. Also mention name of action taken. 200, 400, 800, 900, 850, 700, 950, 100, 150	**07**

OR

Q.4	**(a)**	Define following with respect to Tree: i) M-ary tree ii) Out Degree iii) Leaf	**03**
	(b)	State at least one efficient representation of a sparse matrix.	**04**

	(c)	Discuss algorithm of Breadth First Search (BFS) traversal for a Graph. Explain with an example.	**07**
Q.5	**(a)**	Write algorithm for Bubble sort method.	**03**
	(b)	Write algorithm for Merge sort method.	**04**
	(c)	Explain Sequential Files and Indexed Sequential Files Structures	**07**

OR

Q.5	**(a)**	Create 2-3 Tree for the following sequence: 50, 100, 150, 200	**03**
	(b)	Represent following in form of an expression tree: A+B*(C+D)	**04**
	(c)	State and explain collision resolution techniques in hashing.	**07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2020

Subject Code:3130702   **Date:10/03/2021**
Subject Name:Data Structures
Time:10:30 AM TO 12:30 PM   **Total Marks:56**
Instructions:
1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			Marks
Q.1	(a)	Compare array and linked list.	03
	(b)	Compare primitive and non primitive data types. datastructures	04
	(c)	Write an algorithm to perform insert and delete operations on simple queue.	07
Q.2	(a)	Search the number 50 from the given data using binary search technique. Illustrate the searching process. 10, 14, 20, 39, 41, 45, 49, 50, 60	03
	(b)	Apply merge sort algorithm to the following elements. 20, 10, 5, 15, 25, 30, 50, 35	04
	(c)	Write a 'C' program for bubble sort.	07
Q.3	(a)	What is stack? Why do we use multiple stacks?	03
	(b)	Convert the following infix expressions to their prefix and postfix equivalents. 1. A*B+C/D 2. (A*B)+(C/D)-(D+E)	04
	(c)	What is priority queue? Discuss its applications and implementation details.	07
Q.4	(a)	Evaluate the following postfix expression using stack. 53+62/*35*+	03
	(b)	Design an algorithm to perform insert operation in circular queue.	04
	(c)	Design an algorithm to merge two linked list.	07
Q.5	(a)	Define: 1. Acyclic graph 2. Leaf node 3. Complete binary tree	03
	(b)	For following expressions, construct the corresponding binary tree. 1. A+B/C*D-E 2. ((A+B)-(C*D))%((E^F)/(G-H))	04
	(c)	How are graphs represented inside a computer's memory? Which method do you prefer and why?	07
Q.6	(a)	Define: 1. Connected graph 2. Threaded tree 3. Degree of node	03
	(b)	Differentiate between depth first search and breadth first search.	04
	(c)	Design an algorithm to insert a given value in the binary search tree.	07
Q.7	(a)	Explain basic file operations.	03
	(b)	List out applications of hashing.	04
	(c)	What is file organization? Briefly summarize different file organizations.	07

Q.8 **(a)** Give a brief note on indexing. **03**

(b) Build a chained hash table of 10 memory locations. Insert the keys 131, 3, **04**
4, 21, 61, 24, 7, 97, 8, 9 in   hash table using chaining. Use $h(k) = k \mod m$.
(m=10)

(c) Consider the hash table of size 10. Using quadratic probing, insert the keys **07**
72, 27, 36, 24, 63, 81, and 101 into hash table. Take $c_1=1$ and $c_2=3$.

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Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2021

Subject Code:3130702   **Date:19-02-2022**
Subject Name:Data Structures
Time:10:30 AM TO 01:00 PM   **Total Marks:70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	What is time complexity? Explain with example.	**03**
	(b)	Explain malloc and free functions in 'C'. Also discuss advantages of dynamic over static memory allocation.	**04**
	(c)	Explain following: (i) priority queue (ii) primitive data structures (iii) non-primitive data structures (iv) linear data structures (v) nonlinear data structures (vi) applications of stack (vii) sparse matrix	**07**
Q.2	**(a)**	Write an algorithm for infix to postfix conversion.	**03**
	(b)	Write an algorithm to evaluate postfix expression. Explain working of the algorithm using appropriate example.	**04**
	(c)	Write a 'C' program to reverse a string using stack.	**07**
		OR	
	(c)	Write algorithm to (i) insert, and (ii) delete elements in circular queue.	**07**
Q.3	**(a)**	Write user defined 'C' function to insert node at a specific location in singly linked list.	**03**
	(b)	Write user defined 'C' function to delete node from end in circular linked list.	**04**
	(c)	Write a 'C' program to implement queue using linked list.	**07**
		OR	
Q.3	**(a)**	Write user defined 'C' function to insert node at the end in circular linked list.	**03**
	(b)	Write user defined 'C' function to delete node from a specific location in doubly linked list.	**04**
	(c)	Write a 'C' program to implement stack using linked list.	**07**
Q.4	**(a)**	Construct a binary tree from the traversals given below: Inorder: D, B, A, E, G, C, H, F, I Preorder: A, B, D, C, E, G, F, H, I	**03**
	(b)	Write a short on AVL tree.	**04**
	(c)	Explain the concept of B-tree with suitable example and list its applications.	**07**
		OR	
Q.4	**(a)**	Construct a binary search tree from the following numbers. 38, 13, 51, 10, 12, 40, 84, 25, 89, 37, 66, 95	**03**
	(b)	Explain BFS and DFS.	**04**
	(c)	Explain B+ tree with example.	**07**
Q.5	**(a)**	Explain Prim's algorithm.	**03**
	(b)	Write a 'C' program for selection sort.	**04**
	(c)	List out different hash methods and explain any three.	**07**

Q.5 **(a)** Define terms with respect to file: fields, records, database 03
(b) Compare sequential and binary search methods. 04
(c) Apply quick sort for the following data: 07
  9, 7, 5, 11, 12, 2, 14, 3, 10, 6

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III EXAMINATION – SUMMER 2020

Subject Code: 3130702   **Date:27/10/2020**

Subject Name: Data Structures

Time: 02:30 PM TO 05:00 PM   **Total Marks: 70**

Instructions:
   1. **Attempt all questions.**
   2. **Make suitable assumptions wherever necessary.**
   3. **Figures to the right indicate full marks.**

			Marks
Q.1	**(a)**	Differentiate between data types and data structures.	**03**
	(b)	Answer the followings:	**04**
		(1) Give examples of Linear and Non-Linear Data Structures.	
		(2) What do you mean by Abstract Data Types?	
	(c)	Discuss and write a program to implement queue functions using arrays.	**07**
Q.2	**(a)**	Distinguish between stack and queue.	**03**
	(b)	What is top of stack? Why stack is called LIFO list?	**04**
	(c)	What is a circular queue? How do you check the queue full condition? Write an algorithm to count the nodes in a circular queue.	**07**

OR

	(c)	Explain creation, insertion and deletion of doubly linked list with example.	**07**
Q.3	**(a)**	What are binary trees? Mention different types of binary trees with example.	**03**
	(b)	What is a graph? Explain various representations of graphs.	**04**
	(c)	Write an algorithm to add a node into a binary search tree.	**07**

OR

Q.3	**(a)**	What is B -tree of order m? Draw a B-tree of order 3.	**03**
	(b)	Construct a binary tree having the following traversal sequences: Preorder traversal A B C D E F G H I Inorder traversal B C A E D G H F I	**04**
	(c)	Discuss algorithm of Breadth First Search (BFS) traversal for a Graph. Explain with an example.	**07**
Q.4	**(a)**	Explain Sequential file organizations and list its advantages and disadvantages.	**03**
	(b)	How access of record is performed in multi key file organization?	**04**

	(c)	Describe various collision resolution techniques in hashing.	**07**

<div align="center">**OR**</div>

Q.4	**(a)**	Explain indexed sequential file structure.	**03**
	(b)	Explain minimal spanning tree.	**04**
	(c)	What is hashing? What are the qualities of a good hash function? Explain any two hash functions in detail.	**07**
Q.5	**(a)**	Define topological sort?	**03**
	(b)	Compare sequential searching with binary searching in detail.	**04**
	(c)	Examine the algorithm for Insertion sort and sort the following array: 77, 33, 44, 11, 88, 22, 66, 55	**07**

<div align="center">**OR**</div>

Q.5	**(a)**	What do you mean by internal and external sorting?	**03**
	(b)	Write an algorithm for quick sort.	**04**
	(c)	What is Binary Search Tree? Construct a binary search tree for the following elements 21, 16, 24, 18, 22, 25, 26, 27, 29, 33	**07**

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2021

Subject Code:3130702   **Date:08/09/2021**
Subject Name:Data Structures
Time:10:30 AM TO 01:00 PM   **Total Marks:70**
Instructions:
    1. **Attempt all questions.**
    2. **Make suitable assumptions wherever necessary.**
    3. **Figures to the right indicate full marks.**
    4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Explain primitive and Non-primitive data types in detail.	**03**
	(b)	Explain Binary Search with example.	**04**
	(c)	Explain Asymptotic Notations in detail.	**07**
Q.2	**(a)**	Differentiate: Static and Dynamic Memory Allocation	**03**
	(b)	Explain linear and Non-linear data structure with example.	**04**
	(c)	What is stack? Explain operations on stack in detail.	**07**
		OR	
	(c)	What is queue? Explain operations on queue in detail.	**07**
Q.3	**(a)**	Explain advantages of circular queue over Simple queue.	**03**
	(b)	Explain Tower Of Hanoi with example.	**04**
	(c)	Write and explain algorithm for deletion in Singly Linked List.	**07**
		OR	
Q.3	**(a)**	Evaluate the following postfix expression in tabular form: 3 5 * 6 2 / +	**03**
	(b)	Explain Dequeue and Priority queue in detail.	**04**
	(c)	Write and Explain algorithm for insertion in doubly linked list.	**07**
Q.4	**(a)**	Define the following: 1. Sibling 2. Forest 3. Strictly Binary Tree	**03**
	(b)	Construct BST for following sequence and find inorder traversal for the same. 35, 46, 29, 2, 24 ,68, 44, 57, 1, 22, 79, 71	**04**
	(c)	Explain Prim's algorithm with suitable example.	**07**
		OR	
Q.4	**(a)**	Write an algorithm for selection sort.	**03**
	(b)	Differentitae: BFS and DFS.	**04**
	(c)	Explain Kruskal's algorithm with suitable example.	**07**
Q.5	**(a)**	Explain indexed file organization.	**03**
	(b)	Explain rotation rules for AVL tree.	**04**
	(c)	Explain insertion and deletion in B-tree with example.	**07**
		OR	
Q.5	**(a)**	Explain random file organization.	**03**
	(b)	Explain collision resolution techniques with example.	**04**
	(c)	Construct AVL tree for following sequence: 10, 20, 30, 40, 50, 60, 70 ,80	**07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– III (NEW) EXAMINATION – SUMMER 2022

Subject Code:3130702   **Date:28-07-2022**
Subject Name:Data Structures
Time:02:30 PM TO 05:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Compare static memory allocation and dynamic memory allocation.	**03**
	(b)	Differentiate: (i) primitive and non-primitive data structures (ii) linear and non-linear data structures	**04**
	(c)	What is time and space complexity? Explain asymptotic notations in detail.	**07**
Q.2	**(a)**	Convert following infix to prefix and postfix expression: (a + (b * c) / (d – e))	**03**
	(b)	Write a 'C' program to reverse the string using stack.	**04**
	(c)	Enlist applications of stack. Write an algorithm to push and pop elements with respect to stack.	**07**
		OR	
	(c)	Enlist applications of queue. Write an algorithm to insert and delete elements with respect to simple queue.	**07**
Q.3	**(a)**	What is priority queue? Explain with example.	**03**
	(b)	Write an algorithm to delete a node from doubly linked list.	**04**
	(c)	Write a 'C' program to implement a circular queue using array with all necessary overflow and underflow checks.	**07**
		OR	
Q.3	**(a)**	Briefly discuss malloc( ) memory allocation function.	**03**
	(b)	Write an algorithm to insert a node into doubly linked list.	**04**
	(c)	Write a 'C' program to implement singly linked list with (1) insert (2) delete and (3) total_node_count functions.	**07**
Q.4	**(a)**	Define complete binary tree and almost complete binary tree.	**03**
	(b)	What is a graph? Explain various representations of graphs.	**04**
	(c)	What is a binary search tree? Create a binary search tree for inserting the following data. 50, 35, 100, 25, 41, 120, 105, 46, 90, 95 Explain delete operation for above tree.	**07**
		OR	
Q.4	**(a)**	Discuss the properties of a B-Tree.	**03**
	(b)	Construct a binary tree from the traversals given below: Inorder: 5, 8, 11, 12, 13, 16, 15, 19, 18, 21 Postorder: 5, 11, 12, 8, 16, 18, 21, 19, 15, 13	**04**

(c) What is a minimum spanning tree? Explain Kruskal's algorithm for finding a minimum spanning tree.   **07**

Q.5 **(a)** Define topological sort?   **03**
    (b) Explain indexed sequential file structure.   **04**
    (c) Describe various collision resolution techniques in hashing.   **07**

OR

Q.5 **(a)** Differentiate: BFS and DFS.   **03**
    (b) Compare sequential searching with binary searching in detail.   **04**
    (c) What is hashing? What are the qualities of a good hash function? Explain any two hash functions in detail.   **07**

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