

**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
<b>Q.1</b>	(a) Discuss various types of data structures with example.	<b>03</b>
	(b) What is hash function used for? Give one example of a hash function.	<b>04</b>
	(c) What is time and space analysis? State and explain time analysis for linear search and binary search method.	<b>07</b>
<b>Q.2</b>	(a) Compare Array and Link list.	<b>03</b>
	(b) State disadvantages of simple queue. How to overcome it?	<b>04</b>
	(c) Write an algorithm for INSERT, DELETE and DISPLAY function of Circular Queue.	<b>07</b>
	<b>OR</b>	
	(c) Write an algorithm for INSERT operation to insert a node at a given position in a Link list.	<b>07</b>
<b>Q.3</b>	(a) Discuss height balance tree.	<b>03</b>
	(b) Discuss Minimal Spanning Tree.	<b>04</b>
	(c) Write a recursive function to compute factorial of a number. Show usage of STACK in recursion for this function.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) Write an algorithm to find length of a simple link list.	<b>03</b>
	(b) Write an algorithm to insert a node in a Circular Link List at the FIRST position.	<b>04</b>
	(c) Write an algorithm for DELETE operation in a Binary search tree.	<b>07</b>
<b>Q.4</b>	(a) Discuss Threaded Binary Tree.	<b>03</b>
	(b) Write an algorithm for a non recursive (Iterative) pre order traversal of Binary search tree.	<b>04</b>
	(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	<b>07</b>
	<b>OR</b>	
<b>Q.4</b>	(a) Define following with respect to Tree: i) M-ary tree    ii) Out Degree    iii) Leaf	<b>03</b>
	(b) State at least one efficient representation of a sparse matrix.	<b>04</b>

- (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: **03**  
50, 100, 150, 200
- (b) Represent following in form of an expression tree: **04**  
 $A+B*(C+D)$
- (c) State and explain collision resolution techniques in hashing. **07**

\*\*\*\*\*

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

- 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, 4, 21, 61, 24, 7, 97, 8, 9 in hash table using chaining. Use  $h(k) = k \bmod m$ . ( $m=10$ ) **04**
  - (c)** Consider the hash table of size 10. Using quadratic probing, insert the keys 72, 27, 36, 24, 63, 81, and 101 into hash table. Take  $c_1=1$  and  $c_2=3$ . **07**

\*\*\*\*\*

**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: **07**  
(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
- 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: **03**  
Inorder: D, B, A, E, G, C, H, F, I  
Preorder: A, B, D, C, E, G, F, H, I  
(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. **03**  
38, 13, 51, 10, 12, 40, 84, 25, 89, 37, 66, 95  
(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**

**OR**

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

\*\*\*\*\*

**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
<b>Q.1</b>	(a) Differentiate between data types and data structures.	<b>03</b>
	(b) Answer the followings:	<b>04</b>
	(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.	<b>07</b>
<b>Q.2</b>	(a) Distinguish between stack and queue.	<b>03</b>
	(b) What is top of stack? Why stack is called LIFO list?	<b>04</b>
	(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.	<b>07</b>
	<b>OR</b>	
	(c) Explain creation, insertion and deletion of doubly linked list with example.	<b>07</b>
<b>Q.3</b>	(a) What are binary trees? Mention different types of binary trees with example.	<b>03</b>
	(b) What is a graph? Explain various representations of graphs.	<b>04</b>
	(c) Write an algorithm to add a node into a binary search tree.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) What is B -tree of order m? Draw a B-tree of order 3.	<b>03</b>
	(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	<b>04</b>
	(c) Discuss algorithm of Breadth First Search (BFS) traversal for a Graph. Explain with an example.	<b>07</b>
<b>Q.4</b>	(a) Explain Sequential file organizations and list its advantages and disadvantages.	<b>03</b>
	(b) How access of record is performed in multi key file organization?	<b>04</b>

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

**OR**

- 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**

**OR**

- 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 **07**  
21, 16, 24, 18, 22, 25, 26, 27, 29, 33



**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: **03**  
 1. Sibling  
 2. Forest  
 3. Strictly Binary Tree  
 (b) Construct BST for following sequence and find inorder traversal for the same. **04**  
 35, 46, 29, 2, 24, 68, 44, 57, 1, 22, 79, 71  
 (c) Explain Prim's algorithm with suitable example. **07**
- OR**
- Q.4** (a) Write an algorithm for selection sort. **03**  
 (b) Differentiate: 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: **07**  
 10, 20, 30, 40, 50, 60, 70, 80

\*\*\*\*\*

**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
<b>Q.1</b>	(a) Compare static memory allocation and dynamic memory allocation.	<b>03</b>
	(b) Differentiate: <ul style="list-style-type: none"> <li>(i) primitive and non-primitive data structures</li> <li>(ii) linear and non-linear data structures</li> </ul>	<b>04</b>
	(c) What is time and space complexity? Explain asymptotic notations in detail.	<b>07</b>
<b>Q.2</b>	(a) Convert following infix to prefix and postfix expression: (a + (b * c) / (d - e) )	<b>03</b>
	(b) Write a 'C' program to reverse the string using stack.	<b>04</b>
	(c) Enlist applications of stack. Write an algorithm to push and pop elements with respect to stack.	<b>07</b>
	<b>OR</b>	
	(c) Enlist applications of queue. Write an algorithm to insert and delete elements with respect to simple queue.	<b>07</b>
<b>Q.3</b>	(a) What is priority queue? Explain with example.	<b>03</b>
	(b) Write an algorithm to delete a node from doubly linked list.	<b>04</b>
	(c) Write a 'C' program to implement a circular queue using array with all necessary overflow and underflow checks.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) Briefly discuss malloc( ) memory allocation function.	<b>03</b>
	(b) Write an algorithm to insert a node into doubly linked list.	<b>04</b>
	(c) Write a 'C' program to implement singly linked list with (1) insert (2) delete and (3) total_node_count functions.	<b>07</b>
<b>Q.4</b>	(a) Define complete binary tree and almost complete binary tree.	<b>03</b>
	(b) What is a graph? Explain various representations of graphs.	<b>04</b>
	(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.	<b>07</b>
	<b>OR</b>	
<b>Q.4</b>	(a) Discuss the properties of a B-Tree.	<b>03</b>
	(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	<b>04</b>

- (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**

\*\*\*\*\*