Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering / Science

End Sem (Odd) Examination Dec-2022

CS3CO31 / IT3CO02 / BC3CO36 Data Structures

Programme: B.Tech. / B.Sc.(CS) Branch/Specialisation: CSE All / IT / Computer Science

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. Which of the following is not true about abstract data type (ADT): **1**

(a) An abstract data type is a mathematical model
(b) Abstract data types are generalizations of primitive data types
(c) ADT's specification depends upon implementation
(d) ADT's specification is independent of any particular implementation

ii. Any problem which is implemented with recursion can be implemented with: **1**

(a) Switch case (b) Loop (c) If-else (d) If elif else

iii. Which of the following operations is performed more efficiently by doubly linked list than by singly linked list? **1**

(a) Deleting a node whose location in given
(b) Searching of an unsorted list for a given item
(c) Inserting a node after the node with given location
(d) Traversing a list to process each node

iv. A variant of the linked list in which none of the node contains NULL pointer is- **1**

(a) Singly linked list (b) Doubly linked list
(c) Circular linked list (d) None of these

v. Consider the following sequence of operations on an empty stack. **1**

push(31)
push(65)
pop()
push(25)
push(22)
X = pop()

Consider the following sequence of operations on an empty queue.
enqueue(90)
enqueue(14)
dequeue()
enqueue(21)
enqueue(77)
Y = dequeue()
The value of X + Y is _____.
(a) 38 (b) 36 (c) 99 (d) 112

vi. The following postfix expression with single digit operands is evaluated using a stack: 16 2 4 ^ / 3 4 * + 7 9 * - note that ^ is the exponentiation operator. The top two elements of the stack after the first * is evaluated are: **1**
(a) 5,7 (b) 12,1
(c) 16, 2 (d) 5,1

vii. Which one of the following in place sorting algorithms needs the minimum number of swaps? **1**
(a) Insertion sort (b) Bubble sort
(c) Selection Sort (d) Quick sort

viii. Which one of the following sorting algorithms sort the following array by using minimum number of comparisons? **1**

23	37	53	59	64	72	89	94	156	197

(a) Insertion sort (b) Bubble sort
(c) Selection Sort (d) Quick sort

ix. The postorder traversal of a binary tree is 8, 9, 6, 7, 4, 5, 2, 3, 1. The inorder traversal of the same tree is 8, 6, 9, 4, 7, 2, 5, 1, 3. The height of a tree is the length of the longest path from the root to any leaf. The height of the binary tree above is- **1**
(a) 2 (b) 3 (c) 4 (d) 5

x. Most suitable data structure for breadth first search (BFS) implementation is- **1**
(a) Stack (b) Queue (c) Linked list (d) Tree

Q.2 i. What do you understand by data structure? Give a real-life example where it can be used. **2**

ii. A 2-dimensional array is stored row by row, then what is the address of matrix element A[i,j] for n row and m column matrix? How array representation of polynomial $2x^2+5xy+y^2$ can be done? **3**

iii. Write a program to copy an array into other array with the use of pointer. **5**

OR iv. Explain linear and non-linear data structure with the help of example. **5**

Q.3 i. List some applications of linked list? **2**

ii. Illustrate doubly linked list. Write down benefits and disadvantages of doubly linked list over singly linked list. **8**

OR iii. (a) Illustrate Circular linked list. **8**
(b) Write an algorithm for insertion in sorted linked list.

Q.4 i. What do you understand by 'stack underflow' condition. Write a statement to detect it. **3**

ii. Write down some disadvantages of simple queue. How to overcome it? **7**

OR iii. Write an algorithm to convert postfix expression into infix expression. Demonstrate algorithm by evaluating postfix expression in tabular form: 3 5 * 6 2 / +? **7**

Q.5 i. Demonstrate binary search to search a key=54 in following array: **4**

13	37	43	54	64	82	99	124	166	234

ii. (a) Enumerate methods for choosing the pivot element in quick sort. **6**
(b) Compare the various hashing techniques.

OR iii. 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 c1=1 and c2=3. **6**

Q.6 Attempt any two:

i. Demonstrate applicability of graph data structure? Describe the various representation of graph with example? **5**

ii. Brief the properties of AVL trees. Explain about rotations performed for insertion in AVL search tree with example. **5**

iii. Enumerate benefits for threaded tree. Write an algorithm for inorder traversal in a threaded binary tree. **5**

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Marking Scheme

CS3CO31 / IT3CO02 / BC3CO36 Data Structures

Q.1 i. Which of the following is not true about abstract data type (ADT): **1**
(c) ADT's specification depends upon implementation

ii. Any problem which is implemented with recursion can be implemented with: **1**
(b) Loop

iii. Which of the following operations is performed more efficiently by doubly linked list than by singly linked list? **1**
(a) Deleting a node whose location in given

iv. A variant of the linked list in which none of the node contains NULL pointer is- **1**
(c) Circular linked list

v. Consider the following sequence of operations on an empty stack. **1**
push(31)
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X = pop()
Consider the following sequence of operations on an empty queue.
enqueue(90)
enqueue(14)
dequeue()
enqueue(21)
enqueue(77)
Y = dequeue()
The value of X + Y is _____.
(b) 36

vi. The following postfix expression with single digit operands is evaluated using a stack: 16 2 4 ^ / 3 4 * + 7 9 * - note that ^ is the exponentiation operator. The top two elements of the stack after the first * is evaluated are: **1**
(b) 12,1

vii. Which one of the following in place sorting algorithms needs the minimum number of swaps? **1**
(c) Selection Sort

viii. Which one of the following sorting algorithms sort the following array by using minimum number of comparisons? **1**

23	37	53	59	64	72	89	94	156	197

(a) Insertion sort

ix. The postorder traversal of a binary tree is 8, 9, 6, 7, 4, 5, 2, 3, 1. The inorder traversal of the same tree is 8, 6, 9, 4, 7, 2, 5, 1, 3. The height of a tree is the length of the longest path from the root to any leaf. The height of the binary tree above is- **1**
(c) 4

x. Most suitable data structure for breadth first search (BFS) implementation is- **1**
(b) Queue

Q.2	i.	Definition of data structure.	1 mark	**2**
		real-life example of data structure.	1 mark	
	ii.	Address of matrix element A[i,j] for n row and m column matrix	2 marks	**3**
		Array representation of polynomial $2x^2+5xy+y^2$	1 mark	
	iii.	Program to copy an array into other array with the use of pointer.		**5**
		Declaration of variable /structure	1 mark	
		Complete working program	4 marks	
OR	iv.	Definition of linear and non-linear data structure	3 marks	**5**
		Example 1 mark for each example (1 mark * 2)	2 marks	
Q.3	i.	List some applications of linked list At least four points		**2**
	ii.	Illustrate doubly linked list. Definition	2 marks	**8**
		Diagram	2 marks	
		Benefits of Doubly Linked List Over Singly Linked List	2 marks	
		Disadvantages	2 marks	
OR	iii.	(a) Illustrate Circular linked list.		**8**
		Definition	2 marks	
		Diagram	2 marks	
		(b) Algorithm for insertion in sorted linked list.	4 marks	
Q.4	i.	Stack underflow' condition.	2 marks	**3**
		Statement to detect it.	1 mark	
	ii.	Some disadvantages of simple queue.	3 marks	**7**
		Solution to overcome it	4 marks	

OR	iii.	Algorithm to convert postfix expression into infix expression.		**7**
			3 marks	
		Algorithm by evaluating postfix expression in tabular form: 3 5 * 6 2 / +?	4 marks	
Q.5	i.	Demonstrate binary search to search a key=54		**4**
	ii.	(a)Methods for choosing the pivot element in quick sort.		**6**
			3 marks	
		(b) Compare the various hashing techniques.	3 marks	
OR	iii.	Approach to solve problem	3 marks	**6**
		Correct Solution	3 marks	
Q.6		Attempt any two:		
	i.	Applicability of Graph data structure	2 marks	**5**
		Various representation of graph with example	3 marks	
	ii.	Properties of AVL trees.	2 marks	**5**
		Rotations performed for insertion in AVL search tree	2 marks	
		Example.	1 mark	
	iii.	Benefits for threaded tree.	2 marks	**5**
		Algorithm for inorder traversal in a threaded binary tree	3 marks	

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