Roll No. 667965

BCA-C–201

B. C. A. (Second Semester) EXAMINATION, 2023-24

DATA STRUCTURES USING 'C'

Time : $2\frac{1}{2}$ Hours

Maximum Marks : 60

Note : All questions have to be attempted.

Section—A

1. Multiple Choice Type Questions : 1 each

(i) Which of the following is a non-linear data structure ? (CO1, BL-2)

(a) Stack

(b) Queue

(c) Linked List

(d) Binary Trees

(ii) Which of the following operations is used to delete in stacks ? (CO1, BL-2)

(a) Push

(b) Pop

(c) Peek

(d) Traverse

(iii) In a doubly linked list, each node contains pointers to : (CO2, BL-2)

(a) Only the next node

(b) Only the previous node

(c) Both the next and previous nodes

(d) Neither the next nor previous node

(iv) Which sorting algorithm exhibits the best time complexity ? (CO4, BL-5)

(a) Bubble Sort

(b) Merge Sort

(c) Quick Sort

(d) Insertion Sort

(v) What is the primary purpose of a hash table ? (CO1, BL-l)

(a) To store elements in a sorted order

(b) To provide direct access to data elements

(c) To reduce collisions in data storage

(d) To efficiently perform search operations

(vi) Which of the following is true about binary search trees ? (CO2, BL-3)

(a) They have a linear structure

(b) They require additional memory for pointers

(c) They can have at most one child node

(d) They guarantee O(1) search time complexity

(vii) What is the time complexity of the quick sort algorithm ? (CO4, BL-5)

(a) O(n)
(b) O(n log n)
(c) $O(n^2)$
(d) O(log n)

(viii) Which of the following data structures is suitable for implementing a LIFO mechanism ? (CO2, BL-2)

(a) Queue
(b) Linked List
(c) Stack
(d) Array

(ix) In a binary tree, what is the maximum number of children a node can have ? (CO1, BL-1)

(a) 1
(b) 2
(c) 3
(d) Unlimited

(x) Which of the following is not a type of tree traversal ? (CO1, BL-2)

(a) Preorder
(b) Postorder
(c) Inorder
(d) Reverseorder

(xi) What is the primary advantage of using a linked list over an array ? (CO2, BL-3)

(a) Constant time access to elements

(b) Dynamic size allocation

(c) Better cache locality

(d) Random access of elements

(xii) Which of the following is a characteristic of a complete binary tree ? (CO1, BL-l)

(a) Every level is fully filled except possibly for the last level

(b) All nodes have at most one child

(c) Each node has exactly two children

(d) It is not possible to determine the number of nodes

Section—B

Attempt any *four* of the following questions : 3 each

(a) Discuss the advantages and disadvantages of using stacks in data structures. (CO2, BL-3)

(b) Explain the concept of circular linked lists with suitable examples. (CO2, BL-3)

(c) Compare and contrast the time complexities of linear and binary search algorithms. (CO4, BL-5)

(d) Compare and contrast the process of inserting elements into a queue through the array and linked list implementation. (CO3, BL-2)

(e) Discuss the significance of recursion in solving problems efficiently. (CO2, BL-2)

3. Attempt any *two* of the following questions : 6 each

(a) Explain the difference between sparse and dense matrices with examples. (CO1, BL-2)

(b) Create algorithms for deleting elements from a queue through both the array and linked list implementation. (CO2, BL-3)

(c) Design a C program to implement a stack using arrays and perform push and pop operations. (CO3, BL-6)

4. Attempt any *two* of the following questions : 6 each

(a) Draw a diagram and also define the basic terms in the context of Trees : (CO4, BL-5)

(i) Root Node

(ii) Leaf Node

(iii) Path

(iv) Degree

(v) Forest

(vi) tree

(b) What is Sorting ? Explain the concept of the Merge Sort with an example. (CO4, BL-5)

(c) Write a C function to perform a binary search on a sorted array. (CO5, BL-4)

5. Attempt any *two* of the following questions : 6 each

(a) Discuss Infix, Prefix, and Postfix notation with examples. (CO5, BL-3)

(b) What is Searching ? Implement the linear search algorithm in C programming. (CO5, BL-6)

(c) What are the six basic operations that can be performed on any Data Structures ? (CO2, BL-3)