Total No. of printed pages = 7

END SEMESTER EXAMINATION – 2022

Semester : 4th

Subject Code : Co-401

DATA STRUCTURE

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. *All* questions of PART – A are compulsory.

2. Answer any *five* questions from PART – B.

PART – A

Marks – 25

1. Fill up the blanks :   1×5=5

    (a) O(1) means computing time is _____.

    (b) _____ Data structure allows deleting data elements from front and inserting at rear _____.

[Turn over

(c) The process of writing the operators of an expression after their operands is called _____.

(d) Linked list is a collection of data element called nodes, each pointing to the next node by means of _____.

(e) Tree is a _____ data structure.

2. Write True or False : 1×5=5

(a) The term "PUSH" and "POP" is related to the QUEUE.

(b) In Binary search trees the inorder traversal of tree will yeild a sorted list of elements of tree.

(c) Array data structure stores non-homogeneous data elements.

(d) Binary search algorithm works on the principle of divide and conquer.

(e) A data structure where elements can be added or removed at either end but not in the middle is called Deque.

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3. Define the following terms : 1×5=5

(a) Recursion

(b) Heapify

(c) Circular Queue

(d) Malloc

(e) Weighted graph.

4. Choose the most appropriate answer : 1×10=10

(a) Which of the following data structure is non-linear type ?

(i) Strings (ii) Lists

(iii) Stacks (iv) Graph

(b) Stack follows the data structure called as

(i) Last in first out (ii) First in last out

(iii) Last in last out (iv) First in first out

(c) Which of the following case does not exist in complexity theory ?

(i) Best case (ii) Worst case

(iii) Average case (iv) Null case

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(d) The complexity of Binary search algorithm is

(i) O(n)   (ii) O(log n)

(iii) $O(n^2)$ (iv) O(n log n)

(e) If the elements "A", "B", "C" and "D" are placed in a stack and are deleted one at a time, the order they will be removed is

(i) ABCD   (ii) DCBA

(iii) DCAB   (iv) ABDC

(f) In a directed tree any node which has out degree 0 is called a

(i) Leaf   (ii) Tree

(iii) Edge   (iv) None of these

(g) The matrix that has most of the elements (not all) as Zero is

(i) Identity Matrix

(ii) Unit Matrix

(iii) Sparse Matrix

(iv) Zero Matrix

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(h) Merge sort uses the principle of

(i) Divide-and-conquer

(ii) Backtracking

(iii) Heuristic approach

(iv) Greedy approach

(i) The directed tree in which outdegree of each node is less than or equal to two is

(i) Urinary tree

(ii) Binary tree

(iii) Directed graph

(iv) None of the above

(j) A connected graph T without any cycle is called

(i) Cyclic graph   (ii) Free tree

(iii) Tree   (iv) All of these.

PART – B

Marks – 45

5. (a) Differentiate between Linear Data Structure and Non-Linear Data Structure.   4

(b) Explain time complexity and space complexity of an algorithm.   3

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(c) Write some features of algorithm. 2

6. (a) What do you mean by multi-dimensional array? How arrays are represented in memory? 3

(b) What is a string? Write a function for concatenating two strings STR1 and STR2 to get new strings STR3. 2+4=6

7. (a) Write some differences between Linked List and Array. 3

(b) Define Linked List? Write a function to insert a node at the beginning of a Linked List. 2+4=6

8. (a) Define Merging and Merge sort. 2+3=5

(b) Write the functions for Push operation of Stack. 4

9. (a) What is a Binary tree? Write some properties of binary tree. 2+2=4

(b) What are the different ways of traversing a binary tree? Write a function for preorder traversal of a binary tree. 5

10. (a) Explain Bubble Sort with an algorithm. 5

(b) Write a function to implement binary search and compute its complexity. 4

11. (a) Define Spanning tree and Adjacency matrix. 4

(b) Convert $((A - (B+C))*D) \uparrow (E+F)$ infix expression to postfix form. 5

12. Write short notes on any three: 3×3=9

(a) Towers of Hanoi

(b) Direct access file organization

(c) Inorder Binary Tree Traversal

(d) Heap and Priority queue.