Total No. of printed pages = 3

CSE 181304

17/2/23

Roll No. of candidate | | | | | | | | | | |

2023

B.Tech. 3rd Semester End-Term Examination

DATA STRUCTURE AND ALGORITHMS

(New Regulation and New Syllabus)

Full Marks – 70 Time – Three hours

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

Answer Question No. 1 and any *six* from the rest.

1. Choose the correct option : $(10 \times 1 = 10)$

(i) Time complexity is

(a) Amount of memory times access

(b) Amount of processor time required for the algorithm

(c) Time required to access the variables

(d) The overall time

(ii) Which of the following is an example of constant time complexity?

(a) $O(x^2)$ (b) $O(n)$

(c) $O(a^b)$ (d) $O(1)$

(iii) Which of the following sorting algorithm is worst in terms of space complexity?

(a) Insertion sort (b) Bubble sort

(c) Merge sort (d) Selection sort

(iv) Stack overflow will not occur if

(a) Size of stack is a large

(b) Top points to maximum size

(c) While implementing using linked list

(d) Queue is implemented

[Turn over

(v) Prefix of 1 – 2 + 3*4/5 – 6 is

(a) – + – 12/*3456 (b) */345 – + – 126

(c) – + 1312*3/456 (d) – + 123 – */456

(vi) Number of binary tree can be created using 3 nodes is

(a) 1 (b) 2

(c) 3 (d) 6

(vii) A binary tree of height '5' may be maximum ———— number of nodes.

(a) 5 (b) 25

(c) 31 (d) 32

(viii) The height of complete binary tree with 'n' nodes is

(a) n (b) 2^n

(c) $\log_2(n+1)$ (d) $2n$

(ix) Which linked list has no null address?

(a) Single linked list (b) Doubly linked list

(c) Circular linked list (d) None of these

(x) Which of the following sorting algorithm the lowest asymptotic complexity, in worst case?

(a) Selection sort (b) Bubble sort

(c) Quick sort (d) All of these

2. Define data structures. What are the types of data structures? Give example of each. Name three data structures suitable for storing information and three for data analysis. (3 + 1 + 2 + 4 = 10)

3. How searching is useful? Design an algorithm or a function to implement binary search. (3 + 7 = 10)

4. To sort a large set of numbers, what sorting algorithm you will pick? Why you choose that algorithm? Write that sorting algorithm (or function) of your choice. (1 + 2 + 7 = 10)

5. Design the following functions. (5 + 5 = 10)

(a) Add a node at the end of a linked list

(b) Remove a node from the end of the linked list.

6. What is the demerit of linear queue? How this problem can be overcome? Create a function for this solution. (1 + 1 + 8 = 10)

7. Create an algorithm (or a function) to add a node to a binary search tree. Also give a function to display the tree. (1 + 6 + 3 = 10)

8. Design a function to check for balanced parenthesis with the help of stack data structures. (10)

9. Why balanced trees are important? Name four types of balanced trees. Write a function to count the total number of nodes present in a balanced tree of your choice. (2 + 2 + 6 = 10)