Total No. of printed pages = 4

EI 1815 OE 11

09/01/23

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

2022

B.Tech. 5th Semester End-Term Examination

IE

DATA STRUCTURES AND ALGORITHM BASICS

(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 *four* questions among (Q.2 to Q.7)

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

(i) Which of the following data structure cannot store non-homogeneous data elements?

(a) Arrays (b) Records

(c) Link Lists (d) Stacks

(ii) Which of the following data structure organizes data similar to a line in any supermarket, where first one joining in the line is the first one that comes out?

(a) Stack linked list (b) Queue linked List

(c) Both of these (d) None of these

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

(a) Stack (b) List

(c) String (d) Tree

(iv) If there is a path from each vertex to every other vertex in the digraph, then the it is said to be connected

(a) Non-linearly (b) Strongly

(c) Linearly (d) Weakly

(v) What is the total number of comparisons done in sequential search, for a data size of N?

(a) $\frac{N+1}{2}$ (b) $N-1$

(c) N (d) N^2

(vi) The total number of edges in a complete graph of n vertices is

(a) $n+1$ (b) $\frac{n(n+1)}{2}$

(c) $n-1$ (d) $\frac{n(n-1)}{2}$

(vii) In which of the following data structures it is not necessary to keep track of addresses of every element in it?

(a) Stack (b) Queue

(c) Tree (d) Array

(viii) While deletion process the value of Top pointer of a Stack changes

(a) Before deletion (b) After deletion

(c) at underflow (d) at overflow

(ix) The worst case computational time complexity is

(a) $O(n^2)$ (b) $O(n^3)$

(c) $O(n \log_2 n)$ (d) $O(2n)$

(x) Minimum number of fields in each node of a doubly linked list is

(a) 4 (b) 3

(c) 2 (d) 1

2. (a) What is linked list? Write and explain the algorithm for create and traverse operations in single linked list with example. (2 + 5 = 7)

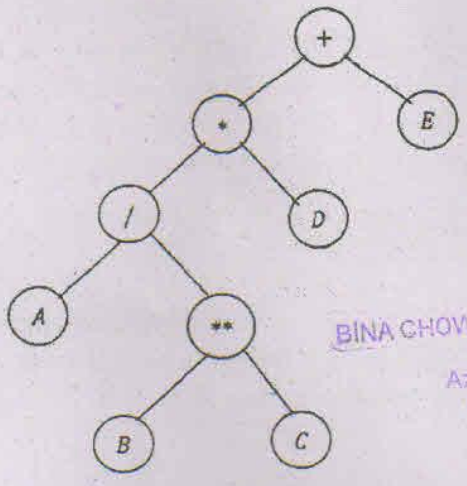
(b) Write algorithm for insert and delete a node from doubly linked list. (4 + 4 = 8)

3. (a) Trace and explain the working of Quicksort algorithm to sort the following list of numbers in ascending order:- 47, 89, 10, 32, 78, 100, 12, 67 (9)

(b) Trace and explain Binary search algorithm to find the number '47' in the sorted list found in Q.3.(a) (6)

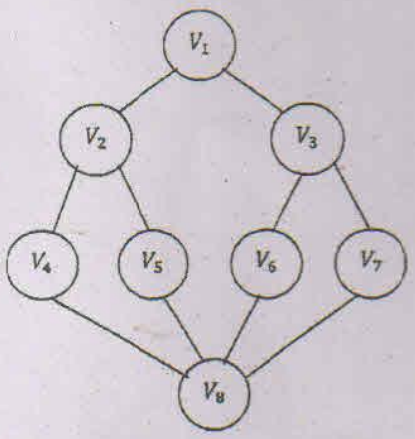
4. (a) Write and explain recursive procedure for in order traversal in a binary tree. (6)

(b) The infix form of an arithmetic expression A/B**C*D + E is represented in the following binary tree. Trace the preorder b-tree traversal algorithm to find the prefix form of the arithmetic expression. (9)



5. (a) Define spanning tree of a graph. State and explain the Kruskal Algorithm for finding minimum spanning tree. (2 + 5 = 7)

(b) Represent the following graph using an adjacency list. Trace the node numbers of the graph visited by applying Breadth First Search (BFS) graph traversal algorithm. (4 + 4 = 8)



6. (a) Define stack data structure. Write and explain the algorithms for adding (Push) to the stack and deleting (Pop) an element from the stack. Use a circular array of size N, for representation of the stack. (2 + 3 + 3 = 8)

(b) The contents of stack S are as follows: (7)

S	99	2	44	8				
Index	0	1	2	3	4	5	6	7

The stack can store maximum of 8 elements and the Top pointer currently points at index 3, as shown by the arrow, Show the stack contents and indicate the position of the Top pointer by an arrow, after each of the following stack operations in sequence:-

(i) Push(S,5); (ii) Push (S, 7); (iii) Pop(s); (iv) Pop (s); (v) Pop(S); (vi) Push(S, –1); (vii) Push(S, 67)

7. (a) Define doubly ended queue (Deque) data structure. Write and explain the algorithms for adding to the Deque and deleting an element from the Deque at both ends. Use a circular array of size N, for representation of the Deque. (1 + 3 + 3 = 7)

(b) Write the binary search algorithm for sorting data array in ascending order. Show that computational complexity of Binary Search algorithm is $O(n \log_2 n)$, where n is the size of the data array. (4 + 4 = 8)