

Total No. of printed pages = 4

BCA 171201

Roll No. of candidate

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2023

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Azara, Hatkhowapara
Guwahati - 781017

B.C.A. 2nd Semester End-Term Examination

DATA STRUCTURE AND ALGORITHM

Full Marks – 70

Time – Three hours

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

(Answer Q. No. 1 and any *four* from the rest)

1. Choose the correct option : (10 × 1 = 10)
- (i) If an array is declared as `int a [5] [6]`, how many elements can be stored in it
- (a) 10 (b) 20
- (c) 30 (d) None of the above
- (ii) While inserting the elements 71, 65, 84, 69, 67, 83 in an empty binary search tree (BST) in the sequence shown, the element in the lowest level is
- (a) 67 (b) 83
- (c) 65 (d) None of the above
- (iii) Which of the following is an application of stack
- (a) Recursion
- (b) Evaluation of postfix expression
- (c) Conversion of arithmetic expression from one notation to another
- (d) All of the above
- (iv) Which of the following data structure allows insertion and deletion at two different end?
- (a) Queue (b) Linked list
- (c) Stack (d) None of the above

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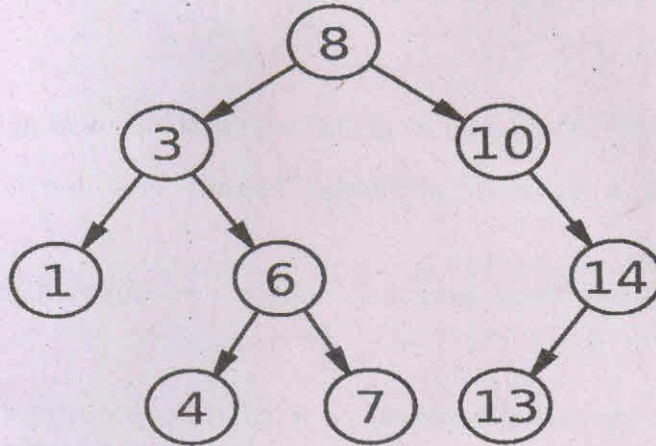
- (v) Pop operation in a stack is performed
- At the middle of the stack
 - At the bottom of the stack
 - At the top of the stack
 - None of the above
- (vi) Which of the following is the prefix form of $A+B*C$?
- $A+(BC^*)$
 - $+AB*C$
 - $ABC+^*$
 - $+A*BC$
- (vii) A polynomial equation can be represented using
- stack
 - array
 - linked list
 - queue
- (viii) In Depth First Search, how many times a node is visited?
- Once
 - Twice
 - Equivalent to number of in degree of the node
 - Thrice
- (ix) The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree?
- 2
 - 3
 - 4
 - 6
- (x) Which of the following data structure allows you to insert the elements from both the ends while deletions from only one end?
- Output-restricted queue
 - Priority Queue
 - Input-restricted queue
 - None of the above

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2. (a) Define Data Structure. Differentiate between linear and non linear data structure? (1+2=3)
- (b) What are the disadvantages of array? Explain how linked overcome these disadvantages? (2+3=5)
- (c) What is circular queue? Explain how insertion and deletion is done in circular queue with an example? (2+3=5)
- (d) Show how the polynomial $P(x) = 7x^2 + 15x^3 - 2x^2 + 9$ can be represented using a linked list. (2)

3. (a) Consider the following binary search tree T

(8)



Draw the resulting binary search tree if the following operation is performed to the tree T

(i) Insert element 19 in T

(ii) Insert element 15 in T

(iii) Insert element 2 in T

(iv) Delete element 14 from T.

(v) Delete element 3 from T

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(b) Explain row and column major representation of a two dimensional array.

(7)

4. (a) What is a binary tree? Mention some of the application of binary tree.

(5)

(b) The in order and post order traversal of a binary tree are as follows

(5)

In Order: 4, 7, 2, 8, 5, 1, 6, 9, 3

Pre order: 1, 2, 4, 7, 5, 8, 3, 6, 9

Construct the binary tree

(c) Prove that for any non empty binary tree T if n_0 is the number of leaf node and n_2 is the number of internal node then $n_0 = n_2 + 1$.

(5)

5. (a) Consider the following sequence of operations on an empty stack.

(5)

push(54); push(52); pop(); push(55); push(62); s = pop(), where push means insertion and pop means deletion
Also consider the following sequence of operations on an empty queue.

enqueue(21); enqueue(24); dequeue(); enqueue(28); enqueue(32);
q = dequeue();, where enqueue means insertion and dequeue means deletion

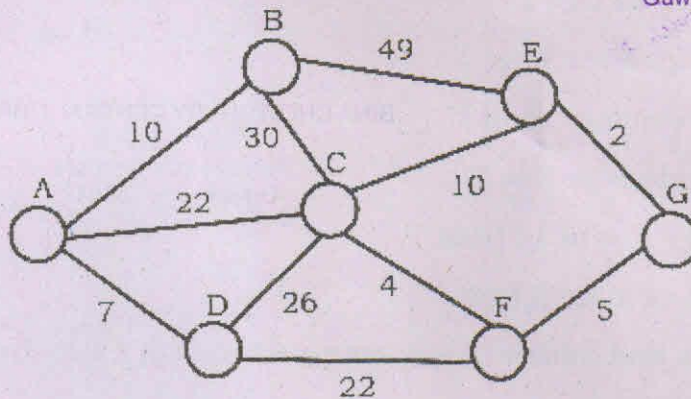
Find the value of s + q.

- (b) Mention some of the application of stack and queue. (5)
- (c) Evaluate the following postfix expression using stack (5)
- 7 5 2 + * 4 1 5 - / -

6. (a) What is a graph? Explain how graph is represented in memory. (2+3=5)
- (b) What are graph traversal methods? Explain how depth first search works. (2+5=7)
- (c) What is spanning tree? Mention some of the application of spanning tree. (1+2=3)

7. (a) Using Prim's algorithm construct a minimum spanning tree of the following graph starting with node A.

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- (b) What is internal sort algorithm? Explain how bubble sort algorithm works with an example? (2+5=7)