



BRAINWARE UNIVERSITY

Course – BSc(CS)

Data Structure and Algorithm (BCSC202)

(Semester – 2)

Time allotted: 3 Hours

Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group –A

(Multiple Choice Type Question)

10 x 1 = 10

1. Choose the correct alternative for any *ten* of the following:
 - i) Which of the following is not the required condition for binary search algorithm?
 - a) The list must be sorted
 - b) there should be the direct access to the middle element in any sublist
 - c) There must be mechanism to delete and/or insert elements in list
 - d) none of above
 - ii) A binary search tree whose left subtree and right subtree differ in height by at most 1 unit is called
 - a) AVL tree
 - b) Red-black tree
 - c) Lemma tree
 - d) None of the above
 - iii) Which of the below mentioned sorting algorithms are not stable?
 - a) Selection Sort
 - b) Bubble Sort
 - c) Merge Sort
 - d) Insertion Sort
 - iv) What is the worst case runtime complexity of search for binary search tree algorithm?
 - a) $O(\log_2 n)$
 - b) $O(n \log_2 n)$
 - c) $O(n)$
 - c) None of these

- v) The fastest sorting algorithm for an almost already sorted array is
- a) Bubble sort b) Selection sort
c) Merge sort c) Insertion sort
- vi) Which of the following is essential for converting an infix expression to a postfix notation?
- a) A parse tree b) An operand stack
b) An operator stack c) All of the above
- vii) The values in a BST can be sorted by ascending order by using which of the following traversals?
- a) Pre - order b) In - order
c) Post - order c) None of these
- viii) The prefix expression for infix expression $a * (b + c) / e - f$
- a) $/*a+bc-ef$ b) $-/*+abcef$
c) $-/*a+bcef$ d) None of these
- ix) In array representation of Binary tree, if the index number of a child node is 6 then the index number of its parent node is
- a) 2 b) 3
c) 4 d) 5
- x) Four algorithms do the same task. Which algorithm should execute the slowest for large values of n
- a) $O(n^2)$ b) $O(n)$
c) $O(\log_2 n)$ c) $O(2^n)$
- xi) The following sequence of operations is performed on a stack : push(1),push(2),pop,push(1),push(2),pop,pop,pop,push(2),pop. Which arrangement of the following will return by pop perations.
- a) 2, 2, 1, 2, 1 b) 2, 2, 1, 1, 2
c) 2, 1, 2, 2, 1 d) 2, 1, 2, 2, 2

Group – B

(Short Answer Type Question)

3 x 5 = 15

Answer any *three* of the following.

2. Convert the following infix expression into equivalent postfix expression using stack.

 $(A + B) * C - (D - E) / (F + G)$.

3. a) What is the precondition of performing binary search in an array ?

b) Write the binary search algorithm.

1+4

4. Compare and contrast Array with Linked list.

5

5. Write short note on tail recursion.

5

6. Show how the following integers can be inserted in an empty binary search tree in the order they are given : 50, 30, 10, 90, 100, 40, 60, 20, 110, 5. Draw the tree in each step.

5

Group – C

(Long Answer Type Question)

3 x 15 = 45

Answer any *three* of the following.

7. a) Given the preorder and inorder sequence and draw the resultant binary tree and write its postorder traversal :

Pre-order : A B D G H E I C F J K

In-order : G D H B E I A C J F K

b) Implement insert and delete operation using array on simple Queue.

7+8

8. a) Define Binary Search Tree with suitable example.

b) Explain the advantage of AVL tree over BST.

c) Create a AVL tree with the following data 6, 3, 1, 2, 4, 5, 9, 11, 8, 12, 10, 14.

4+3+8

9. a) What are the different applications of Stack and Queue?

b) Write an algorithm or C code to delete a node from linked list.

c) Evaluate the following postfix notation using stack, $8\ 5\ 9\ * +\ 6\ 3\ / -$.

3+7+5

10. a) Find the complexity of the following recurrence relation $T(n) = 2T(n-1) + 1$, $T(1)=1$.

b) Write an algorithm or C code for merge sort.

7+8

11. Write short notes on

a) ADT

b) Collision resolution techniques in Hashing

c) linked list

5+5+5