BRAINWARE UNIVERSITY

Course – BCA

Data Structure and Algorithm (BCA 202 / BCAC202)

(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 Questions)   10 x 1 = 10

1. *Choose the correct alternative from the following*

(i) Which of the following is not a property of an algorithm?

    a. Input   b. Output

    c. Definiteness   d. Timeliness

(ii) Which of the following data structure is used to perform infix expression to postfix expression conversion?

    a. Stack   b. Queue

    c. List   d. Heap

(iii) How many number of arrays required to store the polynomial $(-97x^{500}+199x^{10}-90y^{34})$?

    a. 2   b. 3

    c. 4   d. 5

(iv) What is the name of the situation when two distinct key values are mapped to the same storage location?

    a. Page fault   b. Collision

    c. Chaining   d. Probing

(v)   Which of the following data structure is following FIFO (First In First Out) nature?

      a. Stack   b. Queue

      c. Graph   d. Binary Search Tree

(vi)   In a max-heap Data Structure, element with the greatest key corresponds to node

      a. Leaf node   b. First node of left subtree

      c. Root node   d. First node of right subtree

(vii) Which of the following measures the efficiency of an algorithm?

      a. Capacity   b. Processor and Memory

      c. Data and Space   d. Time and Space

(viii) Which of the following sorting algorithms is of divide and conquer type?

      a. Bubble sort   b. Insertion sort

      c. Merge sort   d. Selection sort

(ix)   What will be output after applying In-order traversal in an Expression tree?

      a. Post fix expression   b. Prefix expression

      c. Regular expression   d. Infix expression

(x)   What is the worst time complexity of linear search algorithm?

      a. $O(n)$ b. $O(\log n)$

      c. $O(n \log n)$ d. $O(n^2)$

Group – B

(Short Answer Type Questions)   3 x 5 =15

Answer any *three* from the following

2. Write down the expression to find out the address of a 2D array using Row major and Column major method.   [5]

3. Write an algorithm to perform PUSH and POP operation. Explain the algorithm with suitable examples.   [3+2]

4. Write an algorithm to perform INSERT and DELETE operation in a Queue. Explain the algorithm with suitable examples. [3+2]

5. What is Singly Linked List? Explain with suitable example. [3+2]

6. Suppose the following six numbers are inserted in order into an empty binary search tree T: 50, 77, 30, 66, 40, 33. Draw the tree T by describing each step of insertion. [5]

Group – C

(Long Answer Type Questions)   3 x 15 = 45

Answer any *three* from the following

7. (a) Explain Binary Tree with an example. [5]

   (b) Construct a binary tree whose nodes in two traversal orders are given below:

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

   In-order : D B G E H A C F [10]

8. (a) Translate the following infix expression into its equivalent postfix expression: A + B * D - E + F. [5]

   (b) Write an algorithm which will take a postfix expression and evaluates its value. [5]

   (c) What is the difference between Stack and Queue Data Structure? [5]

9. (a) What is a Max Heap Data Structure? Explain with example. [3+2]

   (b) Sort the following ten numbers using Heap Sort algorithm:

   51, 71, 31, 61, 41, 11, 21, 81, 91, 11. Explain all the necessary steps. [10]

10. (a) Write an algorithm to search an item in the given array. [5]

    (b) Suppose the following eight numbers are inserted in order into an empty AVL tree T: 77, 11, 99, 55, 22, 33, 44, 88. Draw the AVL tree T by describing each step of insertion. [10]

11. (a) What is a hash Function? Explain different hash functions. [5]

    (b) Show that the hash table that results when the letters in COMPUTERSCIENCE are stored in the given order using the linear probe collision resolution method. Assume a hash table of size 19 and use the hash function H(K)=K MOD 19 for the kth letter of the alphabet. [10]