BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – Bachelor of Technology in Computer Science & Engineering

Course Name – Data Structure and Algorithm

Course Code – BCSE201

(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 from the following*

(i) Which of the following methods had the best average case complexity for searching?

a. Hashing b. Sequential search

c. Random search d. Binary search

(ii) What is the time complexity of binary search?

a. O (n^2) b. O (n)

c. O (log n) d. O (n log n).

(iii) What is the number of edges in a complete graph with 'n' vertices?

a. n (n – 1) b. n (n – 1) / 2

c. n^2 d. 2n – 1

(iv) The following sequence of operations are performed on a stack:

push(A), push(B), pop, push(A), push(B), pop, pop, pop, push(B), pop.

What the correct sequence is of popped out values?

a. B, B, A, B, A b. B, B, A, A, B

c. B, A, B, B, A d. B, A, B, B, B

(v) Which data structure is used to implement Breadth-first-search algorithm?

a. Stack b. Queue

c. Binary tree d. None of these

(vi) A complete binary tree with n leaves contains

a. n nodes b. $\log_2$ n nodes

c. 2n – 1 nodes d. 2^n nodes

(vii) What is the fastest sorting algorithm for an almost already sorted array?

a. Quick sort
b. Merge sort
c. Selection sort
d. Insertion sort

(viii) A vertex of degree one is called

a. Isolated vertex
b. Pendant vertex
c. Colored vertex
d. Null vertex

(ix) A linear collection of data elements where the linear node is given by means of pointer is called

a. Linked list
b. Node list
c. Primitive list
d. None of these

(x) What is the actual string corresponding the postfix form of a string ABC + – D*?

a. (A – (B + C)) * D
b. ((A – B) + C) * D
c. ((A + B) – C) * D
d. (A + (B – C) * D)

Group – B

(Short Answer Type Questions) 3 x 5 = 15

Answer any *three* from the following

2. (a) Consider the array int a[10][10] and the base address 2000, then calculate the address of the array a[2][3] in the row and column major ordering. [3]

   (b) Write the advantage of circular queue over linear queue. [2]

3. (a) Define 'Big *O'* notation. [2]

   (b) Show that the function $f(n)$ defined by [3]

   $f(1) = 1$

   $f(n) = f(n/2) + 1$ for $n > 1$ has the complexity $O(\log n)$.

4. Convert the following infix expression to postfix notation by showing the operator stack and output string after reading each input token: [5]

   A * B + C * (D – E) - F * G

5. (a) How a polynomial such as $6x^6 + 4x^3 – 2x + 10$ can be represented by a linked list? [3]

   (b) What are the advantages and disadvantages of linked list over an array? [2]

6. Show how the following integers can be inserted in an empty binary search tree in the order they are given: [5]

   50, 30, 10, 90, 100, 40, 60, 20, 110, 5

   Draw the tree in each step.

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following

7. (a) What do you mean by hashing? [2]

   (b) What are the applications where you will prefer hash tables to other data structures? [3]

   (c) What do you mean by collision? How is it handled? [6]

   (d) Write the recursive function for the problem of Tower of Hanoi problem. [4]

8. (a) Show the stages in growth of an order-3 *B*-tree when the following keys are inserted in the order given: [7]

   74, 72, 19, 87, 51, 10, 35, 18, 39, 60, 76, 58, 19, 45

   (b) How do AVL trees differ from binary search tree? [3]

   (c) Insert the following keys in the order given below to build them into an AVL tree: [5]

   8, 12, 9, 11, 7, 6

   Clearly mention different rotations used and balance factor of each node.

9. (a) What is divide and conquer approach? [2]

   (b) Why does Quick Sort run faster than bubble sort in most of the cases? [3]

   (c) Show how the merge sort algorithm will sort the following array in increasing order: [6]

   100, 90, 80, 70, 60, 50, 40, 30, 20

   (d) Analyze the time complexity of the merge sort algorithm. [4]

10. (a) Given the pre-order and in-order sequence and draw the resultant binary tree and write its post-order traversal: [5]

    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) Find the postfix notation of [5]

    $(a + b * x) / (a - d) * (s - c) * y$ (Using Tree).

    (c) Write a C function for selection sort and also calculate the time complexity for selection sort. [5]

11. Write a short note of any three of the following. [3x5]

    (a) Abstract Data type.

    (b) B-Tree

    (c) Interpolation Search.

    (d) Asymptotic Notation.

    (e) Threaded binary tree.
