BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – BCA-Hons-2023
Course Name – Data Structure and Algorithm
Course Code - BCA20104
(Semester II)

Full Marks : 60   **Time : 2:30 Hours**

[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)   1 x 15=15

1. *Choose the correct alternative from the following :*

(i) What will be the evaluated result of the following post fix expression: 3,5,7,*,+,12,% ?

    a) 2   b) 3
    c) 0   d) 3.17

(ii) Which one is appropriate for the Big Theta notation?

    a) An asymptotic upper bound on the growth rate of a function.
    b) An asymptotic lower bound on the growth rate of a function.
    c) An asymptotic tight bound on the growth rate of a function.
    d) None of these.

(iii) Consider an array A[20, 10], assume 4 words per memory cell and the base address of array A is 100. What is the address of A[11, 5] ? Assume row major order.

    a) 560   b) 565
    c) 570   d) 575

(iv) Select the time complexity of the function $f(N) = 10N^2 + 5N + 6$ when N is very large.

    a) O(1)   b) O(N)
    c) O(N)   d) $O(N^2)$

(v) Choose the appropriate algorithm design technique used in Merge sort.

    a) Divide-and-conquer   b) Backtracking
    c) Heuristic approach   d) Greedy approach

(vi) If you apply Radix sort on the array : 329, 457, 839, 436, 720, 355, 657, then what will be the output after the second pass?

    a) 329, 355, 436, 457, 657, 720, 839   b) 355, 329, 457, 436, 720, 657, 839
    c) 720, 329, 436, 839, 355, 457, 657   d) 720, 355, 436, 457, 657, 329, 839

(vii) Select from the following:- A vertex with degree one in a graph is called_____.

    a) Leaf   b) Pendant Vertex
    c) End Vertex   d) None of these

(viii) In an array representation of binary tree, if the index number of the child node is 6, then select the index number of its parent node.

a) 2
b) 3
c) 4
d) 5

(ix) Choose the correct answer: to search an item in Binary search tree, average case time complexity is_____.

a) O(nlogn)
b) O(n)
c) O(n*n)
d) O(logn)

(x) Choose the balance factor of each node in an AVL tree for which the tree is balanced.

a) -1,0 or 1
b) greater than 1
c) less than -1
d) None of these

(xi) How is the rear index updated when enqueuing an element into a circular queue?

a) rear = (rear + 1) % size
b) rear = rear + 1
c) rear = (rear - 1) % size
d) rear = rear - 1

(xii) Select the binary tree type where each node is allowed to have either 0 or 2 children.

a) Full binary tree
b) Perfect binary tree
c) Complete binary tree
d) Strictly binary tree

(xiii) In hashing, predict what is a collision.

a) The process of creating a hash code
b) When two distinct keys hash to the same index
c) A step in the hash function
d) The process of resizing the hash table

(xiv) Determine the common method to handle collisions in hashing.

a) Linear Probing
b) Binary Search
c) Breadth-First Search
d) Depth-First Search

(xv) The Ackerman function for all non-negative values of m and n is recursively defined as A(m,n) =

i)   n+1 ,   if m=0
ii)   A(m-1, 1) ,   if m!=0 and n=0
iii) A(m-1, A(m,n-1)) if m!=0, n!=0

Therefore, determine the value of A(1,2).

a) 4
b) 3
c) 5
d) 2

Group-B
(Short Answer Type Questions)   3 x 5=15

2. Write the postfix expression for the infix expression (A + B * C) / (D - E * F) with using stack.   (3)
3. Represent the following polynomial using a singly linked list : $5x^4 + 10x^2 - 3x + 10$.   (3)
4. Discuss the characteristics of an algorithm.   (3)
5. Express with diagram an AVL tree with the following elements: 2,3,4,5,6,7,8,1   (3)
6. Determine the location for inserting the key 103 into a 13-element hash table using the hash   (3)
   function f(key) = key mod 13, with linear probing for collision resolution, after inserting the keys 661, 182, 24, and 103 in sequence.

OR

Explain the concept of collision in the hashing technique.   (3)

Group-C
(Long Answer Type Questions)   5 x 6=30

7. Write down the algorithm of Merge sort. (5)
8. Write the algorithm for PUSH and POP operation in Stack. (5)
9. Compare and contrast Linear Search and Binary Search. (5)
10. Identify the steps to insert a node in the first position of a singly linked list. (5)
11. Explain recursion and differentiate it from iteration. (5)
12. Draw a binary search tree with the following elements: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24. (5)

OR

Draw a B tree of degree 3 from the following elements: 10, 2, 5, 9, 3, 7, 4, 6, 1, 11. (5)

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