



# BRAINWARE UNIVERSITY

Term End Examination 2023  
Programme – BCA-2019/BCA-2020/BCA-2021  
Course Name – Data Structures  
Course Code - BCAC201  
( 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) Select the property of binary tree \_\_\_\_
- a) The root cannot contain NULL
  - b) The first subset is called left subtree
  - c) The second subtree is called right subtree
  - d) The right subtree can be empty
- (ii) Which of the following is an example of an algorithm with  $O(n^2)$  time complexity?
- a) Binary search
  - b) Merge sort
  - c) Bubble sort
  - d) Quick sort
- (iii) What does Big O notation describe?
- a) The exact running time of an algorithm
  - b) The worst-case running time of an algorithm.
  - c) The best-case running time of an algorithm.
  - d) The average-case running time of an algorithm.
- (iv) Which of the following is an example of a time-space tradeoff?
- a) Implementing a binary search using a linear search for small arrays.
  - b) Using a hash table instead of a binary search tree for faster lookups
  - c) Precomputing values and storing them in memory for faster access.
  - d) Using a recursive algorithm instead of an iterative algorithm for easier implementation.
- (v) Show the disadvantages of arrays is-
- a) Data structure like queue or stack cannot be implemented
  - b) There are chances of wastage of memory space if elements inserted in an array are lesser than the allocated size
  - c) Index value of an array can be negative
  - d) Elements are sequentially accessed
- (vi) The smallest element of an array's index is called its
- a) lower bound
  - b) upper bound
  - c) Range
  - d) Extraction

- (vii) Select which one is true for accessing queue —
- a) First in First out  
b) First in last out  
c) Last in First out  
d) None of these
- (viii) Predict how many queues will you need to implement a stack using queue (with only enqueue and dequeue operations)
- a) 1  
b) 2  
c) 3  
d) 4
- (ix) The time complexity of the solution tower of hanoi problem using recursion is
- a)  $O(n^2)$   
b)  $O(2^n)$   
c)  $O(n \log n)$   
d)  $O(n)$
- (x) The other name of dequeue is .....
- a) divided queue  
b) distributed queue  
c) double ended queue  
d) design queue
- (xi) The operation of processing each element in the list is known as
- a) Sorting  
b) Merging  
c) Inserting  
d) Traversal
- (xii) Which is the pointer associated with the stack?
- a) FIRST  
b) FRONT  
c) TOP  
d) REAR
- (xiii) A complete binary tree is
- a) Each node has exactly zero or two children  
b) A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from right to left  
c) A binary tree, which is completely filled, with the possible exception of the bottom level, which is filled from left to right  
d) A tree in which all nodes have degree 2
- (xiv) Select the condition which indicates the queue is empty.
- a) Front=Null  
b) Null=Front  
c) Front=Rear  
d) Rear=Null
- (xv) Select the condition for proper coloring of a graph
- a) two vertices having a common edge should not have same color  
b) two vertices having a common edge should always have same color  
c) all vertices should have a different color  
d) all vertices should have same color

### Group-B

(Short Answer Type Questions)

3 x 5=15

2. Write prefix forms of the expression  $(A+B)*C/D+E^F/G$  (3)
3. Why should we learn about the time complexity of algorithm? (3)
4. What do you understand by the Asymptotic Notations? (3)
5. Compare between Time complexity and Space complexity (3)
6. Evaluate a AVL Tree step by step from from the following list: 21, 26, 30, 9, 4, 14, 28, 18,15,10, 2, 3, 7 (3)

OR

Evaluate the following postfix expression:  $4\ 3\ 1\ * + 8 -$  (3)

### Group-C

(Long Answer Type Questions)

5 x 6=30

7. Describe the different ways to calculate time complexity of any algorithm? (5)

- 8. Why should we care about space complexity? (5)
- 9. Distinguish between primitive data structure and non-primitive data structure. (5)
- 10. Apply bubble sort algorithm to solve the following data:64 34 25 12 22 11 90. (5)
- 11. The time complexity of merge sort and quick sort are the same. Select Which one is efficient sorting and why? (5)
- 12. Justify the following prefix expression: + 9 \* 2 6 (5)

**OR**

Evaluate the advantages of doubly linked list over singly linked list (5)

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