BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – MCA-2022/MCA-2023
Course Name – Data Structures and Algorithms
Course Code - MCA101
(Semester I)

Time : 2:30 Hours

Full Marks : 60

[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 In a graph, what is a vertex?

a) A connection between two edges
b) A node representing an object or entity
c) A directed path between two nodes
d) A weighted edge

(ii) Sate that which of these algorithms will exhibit the best performance If the array is already sorted

a) Merge sort
b) Quick Sort
c) Insertion sort
d) None of these

(iii) Identify the correct option to fill in the blank : The item retrieval in a stack is _____ operation.

a) Push
b) Pop
c) Retrieval
d) Access

(iv) Identify from the following about pointer associated with the stack

a) FIRST
b) FRONT
c) TOP
d) REAR

(v) identify the correct option and fill in the blank space which states deletion operation in queue is done using _____

a) Front
b) Rear
c) Top
d) List

(vi) Select What is a common application of graphs in real-world scenarios?

a) Storing a list of elements in memory
b) Representing hierarchical data
c) Modeling social networks
d) Implementing stack operations

(vii) Select What is the term for a graph in which every node is connected to every other node?

a) Directed graph
b) Bipartite graph
c) Complete graph
d) Cyclic graph

(viii) Select Which sorting algorithm has a worst-case time complexity of O(n^2) but is very simple to implement?

a) Quick Sort
b) Merge Sort
c) Bubble Sort
d) Radix Sort

(ix) Identify the correct procedure of a multidimensional array declaration

a) int[] arr;
b) int arr[[]];
c) int[][]arr;
d) int[[]] arr;

(x) Select Which searching algorithm works best for unsorted or randomly ordered data?

a) Binary Search
b) Linear Search
c) Interpolation Search
d) Quick Search

(xi) Identify from the following that which one is not an advantage of optimised bubble sort over other sorting techniques in case of sorted list of elements.

a) It is faster
b) Consumes less memory
c) Detects whether the input is already sorted
d) Consumes less time

(xii) identify the tree traversals is used To obtain a prefix expression

a) Level-order traversal
b) Pre-order traversal
c) Post-order traversal
d) In-order traversal

(xiii) Choose form the options: The no of external nodes in a full binary tree with n internal nodes is?

a) 1
b) n
c) n+1
d) 2n

(xiv) Choose from the options: When a binary tree is converted into an extended binary tree, all the nodes of a binary tree in the external node becomes

a) Root node
b) External node
c) Internal nodes
d) None of these

(xv) Identify the advantage of recursive approach than an iterative approach?

a) Consumes more memory
b) Consumes less memory
c) Less code and easy to implement
d) More code has to be written

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Explain about algorithm. Write down its characteristics. (3)
3. Evaluate Infix expression to postfix expression using stack: (A+B)*C+(D-E)/F+G (3)
4. Describe the time and space complexities of various sorting algorithms such as bubble sort, merge sort, and quicksort. (3)
5. Evaluate an algorithm to insert an element in a Queue. (3)
6. Illustrate the differences between linear search and binary search. (3)

OR

Write an algorithm for Linear Search. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Distinguish between linear data structure and nonlinear data structure. (5)
8. Explain the concept of the adjacency matrix representation of a graph. (5)
9. Discus Linked representation of Stack with a neat diagram and appropriate algorithm. (5)
10. Define worst case time complexity of Quick Sort using recurrence relation using the recursion tree method (5)
11. Define the time complexity of the factorial of a number using the recursion. (5)
12. Write an algorithm to PUSH ( ) and POP ( ) an element into / from a stack with an example. (5)

OR

Discuss the conversion of the following infix expression to post fix notation ((a+2)*(b+4)) -1 (5)

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