BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.CSE-2022/Dip.CSE-2023
Course Name – Data Structures
Course Code - DCSE-PC301
(Semester III)

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) Identify the data structure that follows the First-In, First-Out (FIFO) principle.
a) Linked List b) Stack
c) Queue d) Array

(ii) Select the term that refers to a data structure where elements are added and removed from the same end.
a) LIFO b) FIFO
c) Priority queue d) Deque

(iii) Select the term that describes a contiguous block of memory used for storing multiple elements of the same data type.
a) Linked list b) Queue
c) Array d) Stack

(iv) Select the type of linked list where the last node points back to the first node, forming a closed loop.
a) Singly Linked List b) Doubly Linked List
c) Circular Linked List d) Array

(v) Select the algorithm used to merge two sorted linked lists into a single sorted linked list.
a) Linear Search b) Binary Search
c) Merge Algorithm d) Breadth-First Search

(vi) Identify the algorithm used to traverse a linked list and visit each node exactly once, usually recursively.
a) Linear Search b) Binary Search
c) Depth-First Search d) Breadth-First Search

(vii) Select the algorithm used to traverse a linked list level by level, visiting all nodes at the same depth before moving to the next level.
a) Linear Search b) Binary Search

c) Depth-First Search d) Breadth-First Search

(viii) Identify the sorting algorithm that repeatedly steps through the list, compares adjacent elements, and swaps them if they are in the wrong order.

a) Heap Sort b) Bubble Sort
c) Merge Sort d) Insertion Sort

(ix) Select the sorting algorithm that is considered an in-place, stable sorting algorithm that builds the final sorted array one item at a time.

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

(x) Trace the sorting algorithm that is based on the principle of repeatedly selecting the smallest (or largest) element from the unsorted part and moving it to the sorted part.

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

(xi) Cite the sorting algorithm that is well-suited for sorting small datasets or for situations where memory usage is a concern.

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

(xii) Trace the search technique that has a time complexity of O(n) in the average case.

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

(xiii) Trace the search technique that is used in computer graphics to find the closest color match.

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

(xiv) Select the search technique that can be used to quickly locate an item in a sorted phone directory.

a) Binary Search b) Hashing
c) QuickSort d) Linear Search

(xv) Cite the sorting algorithm that is known for its efficiency in the average and best-case scenarios, with an average time complexity of O(n log n).

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

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Define a stack data structure and explain its LIFO (Last-In, First-Out) property. (3)
3. State the main operations that can be performed on a stack. (3)
4. Develop the binary tree (B-tree) from the given traversals: Preorder: / + * 1 $ 2 3 4 5 In-order: 1 + 2 * 3 $ 4 – 5 (3)
5. Illustrate the process of binary search with a simple example. (3)
6. Explain the main advantage of bubble sort over other sorting techniques. (3)

OR

Select a scenario where bubble sort would be a suitable sorting method. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Analyze the key differences between a binary tree and a B-tree in terms of structure, use cases, and suitability for large datasets. (5)
8. Identify the key features of a deque (double-ended queue) data structure and provide examples of scenarios where deques are valuable. (5)

9. Define a circular linked list and discuss its applications in situations requiring cyclical data access. Explain how to insert and delete elements in a circular linked list. (5)
10. Summarize the key factors to consider when selecting a searching technique for a specific problem, including dataset characteristics, time complexity, and space complexity. (5)
11. Compare and contrast the sorting algorithms bubble sort and selection sort, analyzing their suitability for different types of datasets. (5)
12. Consider the key differences between a threaded binary tree and a regular binary tree along with decide which tree structure is more efficient for in-order traversal and why. (5)

OR

Decide on the most suitable tree structure for implementing a database index. (5)

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