Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(CSE/AI&MAL/DS/ Internet of Things and Cyber Security including Blockchain Technology) (Sem.–3)

DATA STRUCTURE & ALGORITHMS

Subject Code : BTCS-301-18

M.Code : 76436

Date of Examination: 16-12-2023

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. **Write briefly :**

   a. What is the primary data structure used in linear search and what is its time complexity in the worst-case?

   b. What is the primary characteristic of a stack data structure?

   c. Define the term "asymptotic notation" and provide an example of its use in analyzing algorithms.

   d. What is the primary advantage of a doubly linked list over a singly linked list?

   e. What is the time complexity of the selection sort algorithm in the worst case?

   f. Differentiate between a queue and a priority queue.

   g. What is the primary purpose of an AVL tree in comparison to a standard binary search tree?

   h. In quicksort, what is the pivot element and how is it chosen?

   i. Define a directed graph and an undirected graph and explain the key difference between them.

j. What is the purpose of a Depth-First Search (DFS) algorithm in graph traversal?

SECTION-B

2. Suppose you have two algorithms, A and B, for the same problem and their time complexities are $O(n^2)$ and O(n log n), respectively. Explain when you would prefer to use algorithm A over B and vice versa, considering real-world scenarios.

3. Compare and contrast linear queues, circular queues, and double-ended queues (dequeues). Provide specific use cases where each type of queue is most suitable.

4. Compare the structures and operations of a Binary Tree, Binary Search Tree (BST), and an AVL Tree. How does the balancing factor affect the performance of these structures? Provide real-world applications for each.

5. Compare and contrast the time complexity and efficiency of selection sort, bubble sort, and insertion sort. Under what circumstances would you choose one over the others?

6. Compare and contrast Depth-First Search (DFS) and Breadth-First Search (BFS) algorithms in terms of their traversal strategies. Provide examples of scenarios where one is more suitable than the other.

SECTION-C

7. Describe the fundamental operations of a stack, including "push," "pop," "peek," and "isEmpty." Explain their significance and how they are implemented in a stack data structure?

8. Describe the various types of linked lists, including singly linked lists, doubly linked lists, and circular linked lists. Explain their structures, advantages and common use cases. Provide examples of operations that can be performed on each type.

9. Explain the concept of hashing and its various applications in computer science. Describe the collision resolution techniques such as open addressing and chaining. Discuss the factors to consider when designing a good hash function and its impact on the performance of a hash table.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.