Practice Quiz: Algorithm Midterm Exam

Multiple Choice Questions:

Which of the following best describes the fundamental property of a Binary Search Tree (BST)?

a) All nodes have two children.

b) The left subtree of a node contains only nodes with keys less than the node's key.

c) The right subtree of a node contains only nodes with keys greater than the node's key.

d) All of the above.

In a Hash Table, which collision resolution technique involves maintaining a linked list of collided elements at each hash table index?

a) Linear probing

b) Quadratic probing

c) Separate chaining

d) Double hashing

Which traversal algorithm visits all the nodes of a graph before moving to the next level?

a) Depth-first Search (DFS)

b) Breadth-first Search (BFS)

c) Pre-order traversal

d) In-order traversal

What is the time complexity of searching for an element in a balanced Binary Search Tree (BST)?

a) O(log n)

b) O(n)

c) O(n log n)

d) O(1)

Which of the following is not a valid method to handle collisions in a Hash Table?

a) Linear probing

b) Quadratic probing

c) Separate chaining

d) Hash combining

Which of the following best describes the primary advantage of using a Hash Table over an Array or Linked List for data storage?

a) Constant time access for any element

b) Guaranteed order of elements

c) Efficient sorting operations

d) Linear time access for any element

What is the time complexity of searching for an element in an unbalanced Binary Search Tree (BST)?

a) O(log n)

b) O(n)

c) O(n log n)

d) O(1)

Which of the following traversal algorithms can be used to determine whether a given graph is connected or not?

a) Pre-order traversal

b) In-order traversal

c) Breadth-first Search (BFS)

d) Depth-first Search (DFS)

Short Answer Questions:

Explain the concept of time complexity and its significance in algorithm analysis.

Describe one advantage and one disadvantage of using a Hash Table for data storage and retrieval.

Define the concept of space complexity in algorithm analysis.

What is the significance of a balanced Binary Search Tree (BST) compared to an unbalanced one?

Compare and contrast Breadth-first Search (BFS) and Depth-first Search (DFS) traversal algorithms, highlighting their differences in terms of performance and use cases.

Describe the process of balancing a Binary Search Tree (BST) and explain why balanced trees are preferred over unbalanced ones.

Coding Questions:

Binary Search Tree (BST): Implement a method to find the height of a given Binary Search Tree (BST) in Java.

Hash Table: Implement a method to delete a key-value pair from a Hash Table using separate chaining as the collision resolution technique.

Breadth-first Search (BFS): Implement a method to perform Breadth-first Search (BFS) traversal on a given graph represented as an adjacency list in Java.

Here are the coding questions implemented in Java:

Midterm.java