Assignment 1: Data Structures

Question 1:

Implement a stack data structure using an array in your preferred programming language. Write the code for push, pop, and isEmpty operations. Demonstrate the usage of the stack by pushing five elements and then popping three elements from the stack.

Question 2:

Write a program to implement a queue data structure using a linked list in your preferred programming language. Include functions for enqueue, dequeue, and isEmpty operations. Test your implementation by enqueuing six elements, dequeuing two elements, and then printing the remaining elements in the queue.

Question 3:

Explain the concept of a binary search tree (BST). Provide an algorithm to search for a given value in a BST. Discuss the time complexity of the search operation in the worst case.

Question 4:

Implement a hash table using separate chaining collision resolution technique. Write functions for inserting a key-value pair, retrieving a value based on a key, and deleting a key-value pair. Demonstrate the usage of the hash table by performing a few insertions, retrievals, and deletions.

Question 5:

Discuss the difference between a linked list and an array. Explain the advantages and disadvantages of each data structure. When would you prefer to use a linked list over an array, and vice versa?