
Student Information

Name: ________________________ Student ID: ________________________
Due Date: 9 Oct 11:59pm.
Submit answers on eDimension in pdf format. Submission without student information will **NOT** be marked! Any questions regarding the homework can be directed to the TA through email (contact information on eDimension).

Week 4

Exercise 1

You are given a list of n numbers and you like to design a sorting algorithm that uses BSTs. In particular, you construct a corresponding BST by inserting the keys of the list one by one, and then output the nodes using an in-order traversal of the tree.

Question 1

The complexity of this is:

(A) $\Theta(n)$

(B) $\Theta(n \log n)$

(C) $\Theta(n^2)$

Question 2

Suppose that you use a balanced BST instead. Then the complexity will be:

(A) $\Theta(n)$

(B) $\Theta(n \log n)$

(C) $\Theta(n^2)$

Exercise 2

In the runway scheduling problem when we insert a new event with time t in the already existing BST we follow a certain path from the root of the tree.

1. The consistency condition about $|t - t_i| \geq 3$ for all existing times t_i in the tree can be maintained by only considering nodes along the path of the insertion. (T/F)

2. We augment the information of the nodes of a balanced BST so that we can answer more questions about the keys stored in the BST in:

   (A) $O(\log n)$
   (B) $O(n)$

Exercise 3

1. Suppose we have n keys stored as a Max-Heap and an AVL tree. Since both have a maximum depth of $O(\log n)$, searching if k is in the set of keys takes the same time complexity. (T/F)

2. A Max-Heap captures the same information as a balanced BST regarding the ordering of the keys of the nodes. (T/F)

3. Outputing the keys in increasing order from a given Min-Heap and a balanced BST take the same time complexity. (T/F)

4. The maximum height difference between the leaves of any AVL tree is 1. (T/F)