

COP5536 Advanced Data Structures

Assignment 2

Prof. Sartaj Sahni

Due Date: 12/02/2019

Answers will be graded on correctness, elegance, efficiency, and other quality measures.

Last name:

First name:

UFID:

Question 1: (10)

(a) (10) A min radix priority search tree (RPST) can be defined as a set of pairs (x, y) over $[0 \dots 63]$ of integers. Construct a min RPST by inserting the following pairs in the given order. $(12, 49)$, $(30, 12)$, $(20, 1)$, $(60, 15)$, $(25, 60)$, $(11, 37)$, $(49, 23)$

Show the min RPST after each insertion.

Question 2(10):

Suppose that you are to design a Bloom filter with minimum $P(u)$ and that $n = 100,000$, $m = 5000$, and $u = 1000$.

(a) (5) Using any of the results obtained in the class, compute the number h , of hash functions to use. **Show your computations.**

(b) (5) What is the probability, $P(u)$, of a filter error when h has this value?

Question 3(20):

(a) (10) Insert the following keys into an initially empty splay tree:

8, 2, 1, 4, 3, 6, 5, 7, 9.

Show each step and use the bottom-up method.

(b) (10) Draw the multiple string suffix tree for $S1 = abba$, $S2 = bbbb$, and $S3 = aaaa$.

Question 4 (20):

Consider a segment tree with range $[0, \dots, k]$, where k is an integer.

(a) (10) Describe how a horizontal line segment with end points in the range $[0, \dots, k]$ is deleted from a segment tree. What is the time complexity? **Show how you derived this complexity.**

(b) (10) Let N be the set of nodes of a segment tree in which an interval $[i, j]$ is stored. Prove that N does not contain 3 nodes that are at the same level. (**Must prove for the general cases**)