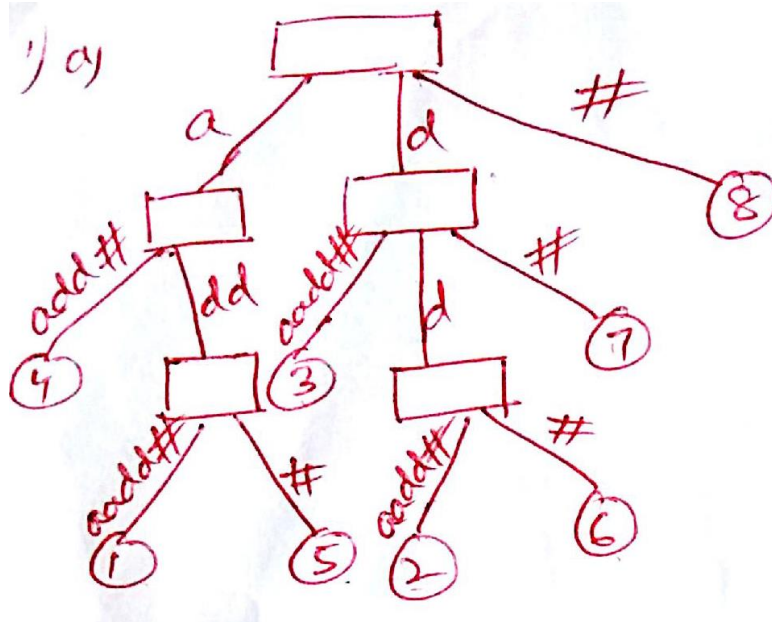


COP 5536
Advanced Data Structures
Spring 2018
Exam 3 Solutions

Q. 1 (12)	Q. 2 (14)	Q. 3 (12)	Q. 4 (12)	Total (50)

Question.1 (12):

Draw a clearly labeled suffix tree for the string *addaadd#*.



For each minor mistakes -1

Incorrect suffix tree (too many errors) : 3 (minimum)

Question 2 (14):

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

(a)(7) Describe how a horizontal line segment is inserted into a segment tree. What is the time complexity? Show how you derive it. Assume that the two endpoints of the horizontal line segment are integers within the range $[0, \dots, k]$ and each leaf node of the segment tree covers an integer range.

(b)(7) If a segment tree contains n horizontal line segments, describe how to report all horizontal line segments that intersect a given vertical line. What is the time complexity? Show how you derive it.

(a) Starting from the root, if node range is covered by the line segment, insert it. Do this step recursively. The time complexity is $O(\log n)$. It is because at most two nodes at each level will be visited.

(b) Let $x = a$ be the expression of the vertical line. Starting from the root, visit node whose range covers a , and report all horizontal line segments in it. Do this until a leaf node is reached. The time complexity is $O(\log n + s)$, where s is the number of horizontal line segments reported.

Incorrect time complexity : -4, if no derivation steps or explanation : -3

Missing s (the number of horizontal line segments): -1,

Question 3 (12):

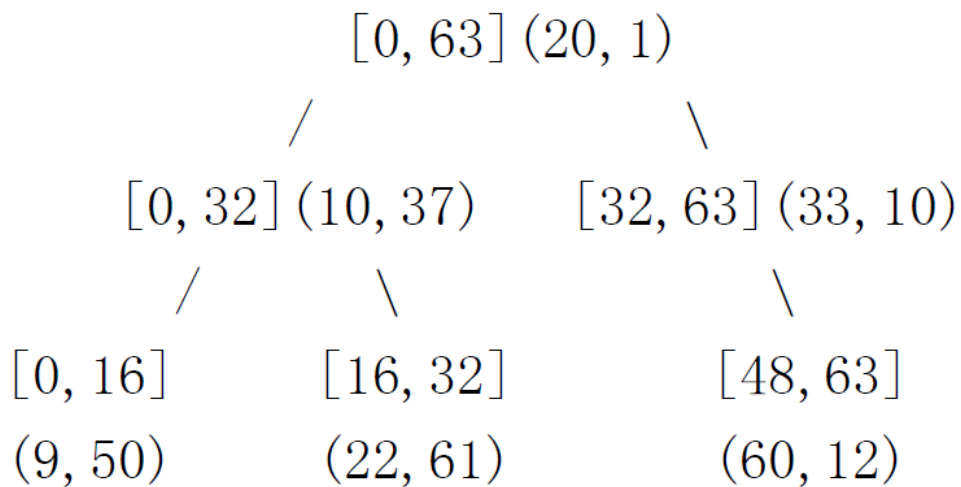
For the min radix priority search tree (RPST) with range $[0,63]$,

(a) (9) Perform insert operations into an initially empty RPST in sequence with the following keys: $(9,50)$, $(33,10)$, $(20,1)$, $(60,12)$, $(22,61)$, $(10,37)$.

Show each step. (Note: The elements x and y of a key (x, y) represents the search and priority key values, respectively.)

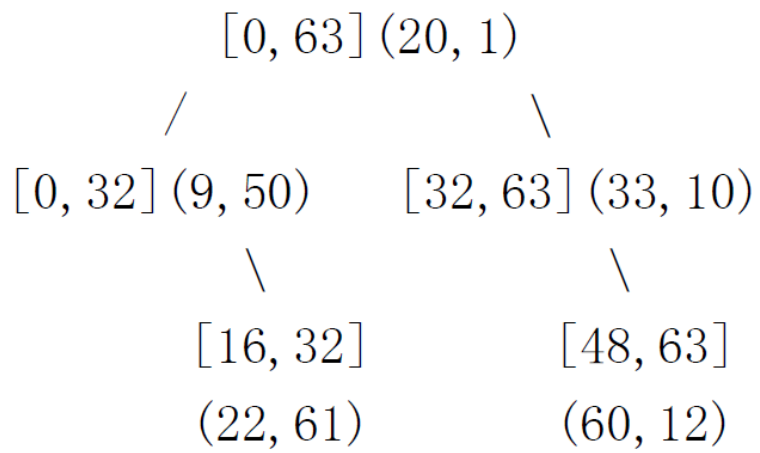
(b) (3) Delete key $(10,37)$ from the result RPST of Part (a). Show the resulting RPST.

a) Solution:



(b) (3) *Delete* key (10,37) from the result RPST of Part (a).

Solution:



Question 4 (12):

With a clear diagram explain how a bloom filter is used with differential files and what are its advantages vs the naïve mode of operation?

(Please refer the slides)

Continue work here if necessary.

