

Spring 2024 COP 3503 Exam #1 2/6/2024 – Part D (Skip Lists, Red-Black Trees) Solution

10) (4 pts) The default description of a skip list indicates that when inserting a value at level k , there is a 50% chance (1 in 2) that the same value should be inserted into level $k+1$. During class, students looked up some information online and suggested that I try two other fractions of the form $1/x$ and $1/y$, where x was an integer and y was an irrational number. What are those two numbers?

$x = \underline{4}$ $y = \underline{e}$, Grading: 2 pts each all or nothing, take off 1 pt if slots flipped

11) (2 pts) Of the values suggested above, which one performed the fastest on the large test run in class?

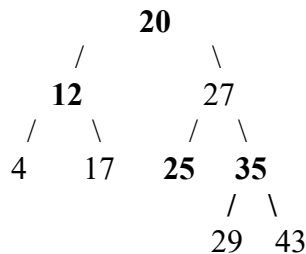
4, Grading: 2 pts all or nothing.

12) (3 pts) In most circumstances, the skip list insertion code in class follows the level k to level $k+1$ rule based on a randomly generated value. There's one exception to this circumstance, what is it?

The exception is if this number is the only number that just got added to level k and is the reason level k is created. There's no need to have two levels with only the same number and nothing else.

Grading: 3 pts, probably mostly all or nothing here, some grader discretion to give partial.

13) (6 pts) Show the final result of deleting the value 25 from the red black tree depicted below. Black nodes are bolded and red nodes are not. (Note: There are two valid correct answers based on the typed notes from class.)



Grading: 1 pt valid R/B tree, 0 pts otherwise, 1 pt to keep 20 and LHS unchanged, 1 pt to have red value at right of 20, 2 pts for the 4 nodes that are changed.

15) (5 pts) Instead of using oil to cook food, what does an air fryer use, heated by a powerful fan, to cook food?

AIR Grading: 5 pts give to all