

University of Waterloo
CS240 Winter 2025
Assignment 3 Post-Mortem

Question 1 [1+3+4=8 marks]

- This question was well done.
- For part c, some students did not use the "same side rule" when performing rotation on deletion.

Question 2 [5 marks]

- In order for a complete proof, one must show that the location of each insertion in T' is the same corresponding location in T . In addition, one must show that no rotations are caused by any insertion into T' .
- Some students did not consider the possibility of rotations during insertion in their proof.

Question 3 [4 marks]

- Many students split the tree into "balanced" levels and "unbalanced" levels. While it is possible to prove using this approach, one must be very careful in order to provide a rigorous proof. In particular, one must show that the "balanced" levels properly represent an AVL-tree. In addition, one must show that the "unbalanced" levels does not asymptotically change the height of the tree to be bigger than $O(\log n)$. Stating $O(\log n) + O(1) = O(\log n)$ is not sufficient proof of this.
- Many students who attempted the question using the proof above failed to provide the sufficient arguments required.
- Many students attempted to perform algebra on asymptotic notation. Avoid doing so whenever possible.

Question 4 [4+2+2=8 marks]

- This question was well done.
- For part a, some students were missing the sentinel-only level of the skip-list.
- For part b, some students provided an incorrect answer of $(\frac{1}{3})^4$ as the probability for one tower having height strictly larger than 4 instead of $(\frac{1}{3})^5$

- For part c, many students did not provide a correct answer.

Question 5 [2+2+(3+3)=10 marks]

- This question was generally well done
- For part c, some students provided incorrect solutions involving algebra with asymptotic notation. Avoid algebra with asymptotic notation whenever possible.
- For part c, some students did not search on distinct keys.

Question 6 [2+4=6 marks]

- This question was generally well done.
- For part b, some students applied ceiling function instead of floor function in their formula for m .