

University of Waterloo
CS240E, Winter 2022
Assignment 5 Post Mortem

This document goes over common errors and general student performance on the assignment questions. We put this together using feedback from the graders once they are done marking. It is meant to be used as a resource to understand what kind of stuff we look at while marking and some common areas where students can improve in.

Question 1 [3 + 2 + 3 + 3 = 11 marks]

- a) Several students had the wrong arc from state 6 and/or 3 in the F^+ automaton. Some students also forgot to include the accepting state and the arrow for σ (the alphabet) at the accepting state.
- b) Generally well done.
- c) Generally well done.
- d) Generally well done.

Question 2 [3 + 3 + 3 = 9 marks]

- a) A few students assumed that all pattern matching algorithms make "guesses" and can't shift the "guess" by more than m characters at a time. These arguments rely on invalid assumptions about how a pattern matching algorithm must work (e.g. assuming it can only go forwards).
- b) The way a lot of students explained their answer for b seems like they forgot Boyer-Moore checks backwards (often something like "the probability of a random bit-string starting with k 0's is ..."). But marks weren't removed for this.
- c) Some students only considered the change to the index 'i' (from the pseudocode) in the step where the mismatch occurs and it increases by m , ignoring that 'i' gets decreased in earlier iterations of the while loop if the characters do match.

Question 3 [3 marks]

- Generally well done.

Question 4 [2 + 4 + 7 = 13 marks]

- a) Generally well done.
- b) Generally well done
- c) Not enough base cases. A couple students claimed x_k must have frequency strictly greater than p_{k-2} (the internal node 1 level below x_k) instead of \geq . These solution were usually very hand-wavy at the end because obviously the proof doesn't work like this.

Question 5 [2 + 2(+5) = 4(+5) marks]

- a) The most common error was not stating the lengths of the code words explicitly.
- b) Some students forgot to multiply by $|S|$.
- c) Of the students who answered, some didn't prove the statement correctly because they made nontrivial assumptions without proof. Some students correctly noted that the tries that get combined by Huffman have the same frequency.

Question 6 [2 + 2 + 3 + 3 = 10 marks]

- a) Generally well done.
- b) Generally well done.
- c) Generally well done.
- d) Some students didn't explain the "idea of the algorithm" at all, just tracing how it decodes N1 from the given input.