Ken Ford

06/30/17

CSCI 3104

Homework 4

1. A) see attached .py file. Note: I think I may have some indentation error somewhere which is giving me an error. I spent several hours trying to fix the error, but I was unable to fix it. I hope that my implementation of the code warrants some credit despite this, as I spent a long time on this assignment.

B) y = encodeStr(x, huffmanEncode(strToFreq(x)))

The running time of strToFreq is O(n), as it increments a counter for each unique character as it goes through the array with length n. The huffmanEncode function runs in O(nlogn), as we increment twice through n for the addition of nodes to the tree and the assignment of Huffman codes to each node. Then, we call heapify for each of these nodes which runs in O(logn) by itself. Thus, the encode algorithm runs in O(2nlogn), or O(nlogn). EncodeStr runs in n time additionally, as it increments through the frequency table and combines all codes into a long, single string. As such, the total run time for y would be O(nlogn + n)

C) Note: text included at bottom of this sheet.

The number of bits require to represent the entirety of the text would be 8\*c, where c is the amount of characters in the text. As such, the portion of the Emancipation Proclamation that I chose has 786 characters in it, so the total bits required to represent it would be 8\*786, or 6,288 (6.288 kilobits). Converting to bytes, this would be 786 bytes.

D) see functions lowerBoundBits and partD in .py file

Note: I was unable to finish this part or any of the other parts afterwards.

**The Emancipation Proclamation  
January 1, 1863**

**A Transcription**

By the President of the United States of America:

A Proclamation.

Whereas, on the twenty-second day of September, in the year of our Lord one thousand eight hundred and sixty-two, a proclamation was issued by the President of the United States, containing, among other things, the following, to wit:

"That on the first day of January, in the year of our Lord one thousand eight hundred and sixty-three, all persons held as slaves within any State or designated part of a State, the people whereof shall then be in rebellion against the United States, shall be then, thenceforward, and forever free; and the Executive Government of the United States, including the military and naval authority thereof, will recognize and maintain the freedom of such persons, and will do no act or acts to repress such persons, or any of them, in any efforts they may make for their actual freedom.