CS 6363: Algorithm Design and Analysis – Fall 2019
Homework #3 – Due: Oct. 16
Professor D.T. Huynh

Problem #1. Do Problem #15.5-1 in [CLRS], page 403.

Problem #2. Generalize Huffman's algorithm to ternary codewords (i.e. codewords using the symbols $0, 1, 2$), and prove that it yields optimal ternary codes.

Problem #3. (Coin changing)

Consider the problem of making change for n cents using the least number of coins.

1. Describe a greedy algorithm to make change consisting of quaters, dimes, nickels, and pennies. Prove that your algorithm yields an optimal solution.

2. Suppose that the available coins are in the denominations $c^0, c^1, \ldots, c^k$ for some integers $c > 1$ and $k \geq 1$. Show that the greedy algorithm always yields an optimal solution.

3. Give a set of coins denominations for which the greedy algorithm does not yield an optimal solution

Problem #4. Do Problem # 16.4-5 in [CLRS], page 443.

Problem #5. Do Problem # 21.2-2 [CLRS], p. 567] and Problem # 21.3-1 [CLRS], p. 572].

Problem #6. Give an efficient algorithm for computing the transition function δ for the string-matching automaton corresponding to a pattern P. Your algorithm should run in time $O(m|\Sigma|)$. (*Hint.* Prove that $\delta(q, a) = \delta(\pi[q], a)$ if $q = m$ or $P[q + 1] \neq a$.)

Problem #7. Do Problem # 32.4-7 in [CLRS], page 1012.