CS 2210: Compiler Design

Homework #1

Due Time: February 7th, 2018

1. (16 points) Construct regular expressions for the following languages.
   
a) All strings of lowercase letters that contain the five vowels in order.
   
b) Strings with even number of quotes. That is, ‘abc’, abc’’dd, aa’a’a’a’ are legal strings while ‘a, ‘a’a’ab’a’ are illegal strings.
   
c) All strings of as and bs that do not contain the subsequence abb.
   
d) All strings of as and bs with an even number of as and an odd number of bs.
   
*Hint: Sometimes it is easier to draw a state graph and then convert it to a regular expression.

2. (8 points) Using the McNaughton-Yamada-Thompson Algorithm, construct an NFA from the regular expression:

   \[ ((01)^*|(001) \]

   a) Draw a state graph for the NFA (\( \Sigma = \{0, 1\} \)).
   
b) Construct the state transition table for the NFA taking into consideration \( \epsilon \)-closures (up to Step 3 of algorithm on slides).

3. (6 points) Convert the above NFA to a DFA.

   a) Construct the state transition table for the DFA, starting from the start state.
   
b) Draw the state graph for the DFA.