CMPE 350 - Spring 2016

PS 2 - 24.02.16

1.7 Give state diagrams of NFAs with the specified number of states recognizing each of the following languages. In all parts the alphabet is $\{0, 1\}$.

b) $\{w|w$ contains the substring 0101 i.e $w = x0101y$ for some x and $y\}$

c) $\{w|w$ contains an even number of 0s or contains exactly two 1s$\}$

1.14 a) Show that if M is a DFA that recognizes language B, swapping the accept and nonaccept states in M yields a new DFA recognizing the complement of B. Conclude that the class of regular languages is closed under complement.

b) Show by giving an example that if M is an NFA that recognizes language C, swapping the accept and nonaccept states in M doesn't necessarily yield a new NFA that recognizes the complement of C. Is the class of languages recognized by NFAs closed under complement? Explain your answer.

1.20 For each of the following languages, give two strings that are members and two strings that are not members-a total of four strings for each part. Assume the alphabet $\Sigma = \{a, b\}$ in all parts

b) $a(ba)^*b$

c) $a^* \cup b^*$

e) $\Sigma^* a \Sigma^* b \Sigma^* a \Sigma^*$

h) $(a \cup ba \cup bb)\Sigma^*$

1.31 For any string $w_1 w_2 \dots w_n$ the reverse of w, written w^R, is the string w in reverse order, $w_n \dots w_2 w_1$. For any language A, let $A^R = \{w^R | w \in A\}$. Show that if A is regular, so is A^R.

1.43 Let A be any language. Define DROP-OUT(A) to be the language containing all strings that can be obtained by removing one symbol from a string in A. Thus, DROP-OUT(A) = $\{xz | xyz \in A$ where $x, z \in \Sigma^*, y \in \Sigma\}$. Show that the class of regular languages is closed under the DROP-OUT operation. Give both a proof by picture and a more formal proof by construction as in Theorem 1.47.

• Show that the class of regular languages are closed under set difference.