CSCI 311/500 Models of Computation
Self Test 6

1. Draw an nfa for the regular expression: \((aba)^* + (b^*a)^*\)

2. Draw an nfa for the following right-linear grammar for the language \(L\):

\[
\begin{align*}
S & \rightarrow bS \mid aA \mid \lambda \\
A & \rightarrow aA \mid bB \mid b \\
B & \rightarrow bS
\end{align*}
\]

3. Give a left-linear grammar for \(L^R\), where \(L\) is the grammar in the previous question.

4. Give an English description of the language accepted by the following regular expression:

\[
b^*(ab^*ab^*)^*ab^* + a^*(ba^*ba^*)^*ba^*
\]

5. Consider the language \(L\) defined on \(\{a, b\}^*\) where every \(a\) is followed by \(bb\).

   (a) Draw an nfa for \(L\).
   (b) Write a regular expression for \(L\).
   (c) Write a regular grammar for \(L\).

6. Consider the language \(L_2\) defined by the regular expression: \(aa^*b + b\).

   (a) Construct a DFA for \(L_2\).
   (b) Give a right-linear or left-linear grammar for \(L_2\).

7. The \textit{nor} of two languages is:

\[
\text{nor}(L_1, L_2) = \{w : w \notin L_1 \text{ and } w \notin L_2\}
\]

Show that the family of regular languages is closed under the \textit{nor} operation.

8. A language is said to be a palindrome language if \(L = L^R\). Find an algorithm for determining if a given regular language is a palindrome language.