Regular Language Questions
Define NFAs for the following over the alphabet \{a,b\}

- \{ w | \text{length}(w)=3 \text{ or } w \text{ is all a’s} \}
- \{w | w \text{ consists of alternating a’s and b’s}\}
- \{w | w \text{ is any string except “aba”}\}
- \{ w | w =x\bullet y \text{ where } x \text{ is an even number of a’s and } y \text{ is an odd number of b’s} \}
1. Which of the following are correct

A. Every DFA is a NFA.
B. If a language, L, is recognized by a DFA there is an NFA that recognizes L as well.
C. Every NFA is a DFA.
D. Every language is recognized by either an NFA or a DFA.
2. True or False

- The following DFA \((Q, \Sigma, \delta, q_0, F)\) recognizes all strings of even length over the alphabet \{a,b\}

\[
\begin{align*}
Q &= \{1, 2, 3\} \\
\Sigma &= \{a, b\} \\
\delta_{1 a} &= 2 \\
\delta_{1 b} &= 2 \\
\delta_{2 a} &= 3 \\
\delta_{2 b} &= 3 \\
\delta_{3 a} &= 2 \\
\delta_{3 b} &= 2 \\
q_0 &= 1 \\
F &= \{3\}
\end{align*}
\]
3. True or False

• S is a prefix of T if there exists another string R, such that $S \cdot R = T$

• Given a DFA $M = (Q, \Sigma, \delta, q_0, F)$ that recognizes the language L. The following is a DFA that recognizes the prefixes of L.

• $M_{\text{prefix}} = (Q, \Sigma, \delta, q_0, F_2)$

• $F_2 = \{ q \mid q \in Q \text{ and there is a path from } q_0 \text{ to } q \}$
4. True or False

• T is a suffix of S iff
  – Exists string Q such that $Q \cdot T = S$

If W is a regular language, then is the language
{$q | w \in W$ and q is a suffix of w} regular?
5. Are comments Regular?

- In certain languages, comment appear between delimiters. For example
  
  /* this is a comment */

  Where “/*” and “*/” are the delimiters.

  A comment must begin with “/*” and end with “*/” but have no intervening “*/”.

  Assume the alphabet = \{a,b,*,/\}
6. True or False

• Let $w^R$ be the reversal of the string $w$

• If $T$ is a regular language, is the language
  $\{ x x^R \mid x \in T \}$ regular?