Problem Set 3 – Due Friday, April 17, 2015

Problem 1. Using the procedure shown in class, convert the following NFA into a DFA for the same language. Show all work.

![NFA Diagram]

Problem 2. Using the procedure shown in class, eliminate all ε-arrows from the following NFA.

![NFA Diagram]

Problem 3. Let $L_1, L_2, L_3 \subseteq \Sigma^*$ be languages and let $Most(L_1, L_2, L_3)$ be the set of all $x \in \Sigma^*$ that are in at least two of $L_1, L_2, L_3$. Prove: if $L_1$, $L_2$, and $L_3$ are DFA-acceptable then so is $Most(L_1, L_2, L_3)$.

Problem 4 Let $Stutter(L) = \{a_1a_1a_2a_2\cdots a_na_n : a_1a_2\cdots a_n \in L\}$. (A) Prove that the DFA-acceptable languages are closed under $Stutter$. (B) Then, having proved it once, give another, entirely different proof.

Problem 5. How many states are in the smallest possible DFA for $\{0,1\}^*\{1^{10}\}$? Prove your result.

Problem 6 Let $L_n$ (for $n \geq 1$) be $\{0,1\}^*\{1\}^n$. Prove that there is an NFA for $L_n$ having $n + 2$ states, but that there is no DFA for $L_n$ having $2^n - 1$ or fewer states. In a well written English sentence or two, give a high-level interpretation of your result.