Problem Set

CS 340 - Theory of Computation

---

1. Let $\Sigma = \{0, 1\}$. Construct DFAs accepting the following subsets of Σ^*.

   (a) $L_1 = \{w \mid w$ contains at least three 0s and even number of 1s$\}$

   (b) $L_2 = \{w \mid$ every consecutive block of three letters in w contains at most one $0\}$

   For the second part, assume that all strings of length less than three are in L_2 except 00.

2. Given a DFA M is it possible to determine if $L(M)$ is finite?

3. Construct a DFA M such that $L(M) = \{w \in \{a, b\}^* \mid$ w has $ababb$ as a substring$\}$.

4. Construct an NFA N with at most 5 states such that $L(N) = L(\alpha)$ where $\alpha = a^* + a^*ba^* + b^* + b^*ab^*$.

5. Let $\Sigma = \{0, 1\}$. Give a regular expression α such that $L(\alpha)$ corresponds to the following set:

   (a) Set of all binary strings with at least one 0 and at least one 1.

6. Let $\Sigma = \{0\}$ and $A = \{0^{n!} \mid n \geq 0\}$. Using pumping lemma prove that A is not regular.