6.045J/18.400J: Automata, Computability and Complexity T.A. Matthew Lepinski

Recitation 2: DFAs and NFAs

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Problem 1: Define the following words, phrases and symbols.

1. Regular Language
2. $(Q, \Sigma, \delta, q_0, F)$
3. ϕ
4. ϵ
5. Regular Operations
6. Nondeterminism
7. Epsilon Transition

Problem 2: Each of the following statements is either True or False.

1. It is possible for a Finite Automaton to recognize an infinite language
2. Every deterministic Finite Automaton is also a non-deterministic Finite Automaton
3. For every nondeterministic Finite Automaton, there is an equivalent non-deterministic Finite Automaton that has no epsilon transitions.
4. For every nondeterministic Finite Automaton, there is an equivalent non-deterministic Finite Automaton that has a single accept state.
5. If you swap the accept states and the reject states on ANY Finite Automaton, the new machine will recognize the compliment of the original language.
6. The class of languages recognized by non-deterministic Finite Automata is closed under complementation.

Problem 3: Create Finite Automata for each of the following languages:

1. The language of all strings that contain both an 'a' and a 'b'
2. The language of strings that contain the substring 'aa' and end in 'b'
3. The language of strings that contain the contain an 'a' and don't end in 'ba'
4. The language of strings that contain at least 2 'a's or at least 3 'b's
5. The language consisting of $(ab)^*$ concantenated with $(bb)^*$.
6. The language of strings where every block of 'a's has an even number of 'a's, except for the last block which has an odd number of 'a's
7. The language of binary numbers that are divisible by 5.