

FLORIDA INTERNATIONAL UNIVERSITY

MAD 3512 Theory of Algorithms

Dr. George Kafkoulis, *George.Kafkoulis@fiu.edu*, DM410B tel: 3053482849

ASSIGNMENT 4.5: NON DETERMINISTIC FINITE STATE ACCEPTERS

Problem 1. Two NFAs or DFAs are called equivalent iff they accept the same language. Prove that any NFA is equivalent to another NFA that has exactly one final state non-initial state.

Problem 2. Prove that any finite language is accepted by an NFA.

Problem 3. Suppose that $N = (Q, T, q_0, \delta, \{q_F\})$ is an NFA with only one final state non-initial state q_F . For $(q, x) \in Q \times (T \cup \{\lambda\})$, define

$$q' \in \gamma(q, x) \iff q \in \delta(q', x)$$

. Prove that

- (1) $N_R \stackrel{\text{def}}{=} (Q, T, q_F, \gamma, \{q_0\})$ is an NFA.
- (2) if you reverse a walk of N , then we get a walk in N_R . and their labels are the reverse string of one another.
- (3) $L(N)^R = L(N_R)$.

Problem 4. Construct an NFA N accepting the language

$$L = \{u \in \{a, b\}^* \mid (n_a(u))^2 - (n_b(u))^2 \text{ is odd}\}.$$

Construct an NFA that accepts $L^\star$ and convert it to an equivalent DFA.