

## Recitation 3: Regular and Non-regular Expressions

20 February, 2003

Discussion Problems

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

1. Regular Expression
2. Inductive definition
3. GNFA

**Problem 2:** Create a regular expression describing the following languages. In all cases the alphabet is  $\{0,1\}$

1.  $\{w \mid w \text{ has an even number of 0's}\}$ .
2.  $\{w \mid w \text{ has length at least 3 and its third symbol is a 0}\}$ .
3.  $\{w \mid w \text{ contains at least three 1s}\}$ .
4.  $\{w \mid \text{every odd position of } w \text{ is a 1}\}$ .
5.  $\{w \mid w \text{ doesn't contain substring 110}\}$ .

**Problem 3:** Sipser Exercise 1.14: Use the procedure described in Lecture to convert the following regular expressions to nondeterministic finite automata.

1.  $(0 \cup 1)^*000(0 \cup 1)^*$
2.  $((00)^*(11) \cup 01)^*$
3.  $\emptyset^*$

**Problem 4:** Sipser Exercise 1.16(b): Use the procedure described in Lecture to convert the following finite automaton to a regular expressions

