

CS381
Fall 2005

First Mid Term

Friday Sept 23, 2005
Olin 155 9:05-9:55

This is a 50-minute in class closed book exam. All questions are straightforward and you should have no trouble doing them. Please show all work and write legibly. Thank you.

1. Let $M_1 = (Q_1, \Sigma, \delta_1, q_{01}, F_1)$ and $M_2 = (Q_2, \Sigma, \delta_2, q_{02}, F_2)$ be finite automata. Construct a finite automaton M that accepts the language $L_1(M_1) \cap L_2(M_2)$.

2. Write a regular expression denoting the set of all strings of 0's and 1's such that every 1 is immediately preceded by at least two consecutive 0's.

Suggestion: To make sure your answer is correct ask yourself some simple questions such as does your expression work for strings with an even number of 1's, an odd number of 1's, short strings, etc.

3. Let $L_1 = \{ww \mid w \in (0+1)^*\}$ and $L_2 = \{0^n 1^n \mid n \geq 1\}$. Express L_2 in terms of L_1 using homomorphisms, inverse homomorphisms and intersection with regular sets.

4. Let L be the set of all strings of 0's and 1's in which a symbol which occurs in the first five symbols of the string also occurs in the last five symbols of the string. Note that a string might be shorter than 10 symbols long. Draw the transition diagram of a nondeterministic finite automata accepting the set L .