CS 201 Formal Foundations of Computer Science **Fall Semester, 1998**

Practice Exercises to Prepare for Final Exam

December 6, 2000

On the back of this page are some practices exercises on the material covered on the topic of modeling computation. You can expect to see a small variation of one such problem on the final. The final exam is on Friday December 15th from 9:30am-12:30pm in Wilson 100. It will be written as a 2 hour exam with extra time available as with the earlier exams. If you have a final from 8am-10am and cannot come until 10:30am and would like to continue until 1:30pm that is fine. This option of continuing after 12:30pm is only available for those who have an earlier exam. Everyone else should come at 9:30 if you want to have 3 hours (versus 2 hours).

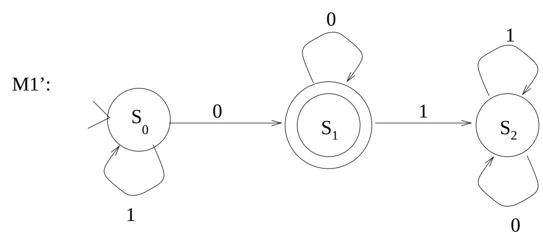
The final will focus on the material of Homeworks 8, 9 and 10, but also WILL include some questions that test the material from earlier homeworks (particularly, induction and program correctness). It is a closed book exam. However, you can bring one $8\frac{1}{2} \times 11$ crib sheet (with both sides used if desired).

Solutions to these practice problems as well as the solutions to the other problems can be found on the CS 201 home page under homeworks between now and the final.

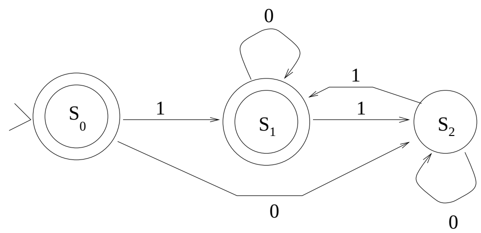
Practice Problems for Final:

1. What is the language recognized by the following deterministic finite-state automaton (DFA)?

   (a) M_1:



   (b) M_2:



2. For each of the following languages, either give a DFA that recognizes the language (i.e. a DFA M, such that $L(M)$ is the desired language), a regular grammar for the language, or prove that no DFA can recognize the language. All languages are defined over the set of all bit strings.

   (a) Let L_1 consist of strings having an even number of 1s and an odd number of 0s.

   (b) Let L_2 consist of strings in which there are never two consecutive 0s and there are never two consecutive 1s.

   (c) Let L_3 consist of strings that has exactly 3 times as many 0s has it has 1s.

3. (a) Write a grammar G such that $L(G) = \{0^{2n}1^n \mid n \geq 0\}$.

   (b) Could $L(G)$ be expressed by a regular (type 3) grammar? Your answer should either provide such a grammar or prove that $L(G)$ cannot be recognized by any DFA (thus implying there is no type 3 grammar producing $L(G)$).

4. What is the language generated by the grammar with productions $S \to 10A$, $A \to 00A$, and $A \to \lambda$ where $T = \{0, 1\}$ an S is the start symbol?