Homework 03

Due: Tuesday, February 7, 2006

Note: This assignment cannot be accepted late because solutions will be distributed at the Feb. 7 class meeting in preparation for Exam 1.

Instructions

1. Please review the homework grading policy outlined in the course information page.

2. On the *first page* of your solution write-up, you *must* make explicit which problems are to be graded for regular credit, which problems are to be graded for extra credit, and which problems you did not attempt. Use a table that looks like this:

Problem	1	2	3	4	5	6	7	8	9	...
Credit	RC	RC	RC	EC	RC	EC	NA	NA	EC	...

   where "RC" denotes "regular credit", "EC" denotes "extra credit", and "NA" denotes "not attempted". Failure to include such a table will result in an arbitrary set of problems being graded for regular credit, no problems being graded for extra credit, and a 5% penalty assessment.

3. You must also write down with whom you worked on the assignment. If this varies from problem to problem, write down this information separately with each problem.

Problems

Required: 5 of the following 7 problems
Points: 20 points per problem

1. Do Exercise 1.21(a), but do it two ways:
   - eliminating first state 1, then state 2
   - eliminating first state 2, then state 1

   Show the resulting GNFA after each step, and do not try to simplify your answers (except for eliminating all instances of Φ and all instances of ε in concatenations).

2. Do Exercise 1.21(b), but do it two ways:
   - eliminating states in the order 1, then 2, then 3
   - eliminating states in the order 3, then 2, then 1

   Show the resulting GNFA after each step, and do not try to simplify your answers (except for eliminating all instances of Φ and all instances of ε in concatenations).

3. - Do Exercise 1.29(b).
   - Do Problem 1.46(a).

4. Do Problem 1.46(c,d).

5.
   - Do Problem 1.35.
   - Prove that the language $\{w \mid \text{ every prefix of } w \text{ contains at least as many 0s as 1s}\}$ is not regular.

6. Do Problem 1.55(c,e,f,g,i,j). Interpret the *minimum pumping length* to be the smallest value of p such that all three conditions of the Pumping Lemma hold. (In some cases, a smaller value of p may work if only conditions 1 and 2 are required to hold, but we require that all three conditions hold.)

7. Prove or disprove each of the following:

   a. Every subset of a regular language is regular.

   b. If A and B are regular languages, then $A - B$ is regular.

   c. If A is a regular language and B is a language such that $A \cup B$ is regular, then B is regular.

   d. If A is a regular language and B is a language such that AB is regular, then B is regular.