

3 Homework

Due: Wednesday, October 3, 2007.

Instructions

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

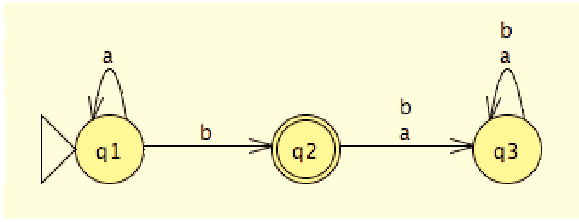
- You must also write down with whom you worked on the assignment. If this varies from problem to problem, write down this information separately with each problem.

Problems

Required: 5 of the following 7 problems

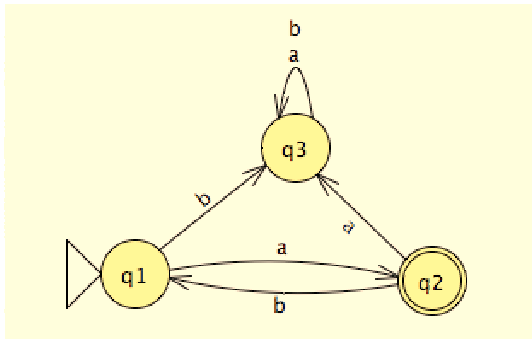
Points: 20 points per problem

1. Use the procedure described in Lemma 1.60 in the text to convert the following DFA to a regular expression in two different ways:
 - eliminating first state 3, then state 2, then state 1
 - eliminating first state 1, then state 2, then state 3



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

2. Use the procedure described in Lemma 1.60 in the text to convert the following DFA to a regular expression in two different ways:
 - eliminating first state 3, then state 2, then state 1
 - eliminating first state 1, then state 2, then state 3



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

3. Use the pumping lemma to show that the following languages are not regular.
 - (a) $\{w \mid w = a^k b a^k \text{ for any } k \geq 0\}$
 - (b) $\{w \mid w = a^i b^j c^k \text{ where } i, j, k \geq 0 \text{ and either } i = j \text{ or } i = k\}$
4. Do Problem 1.46(c, d).
5. Do Problem 1.55, but for the following languages:

- (a) ab^*a
 - (b) $aab \cup a^*b^*$
 - (c) $(abab)^*$
 - (d) ϵ
 - (e) $ababa$
 - (f) a^*bbba^*
6. (a) Do Problem 1.47
- (b) Do Problem 1.48
7. Prove or disprove the following:
- (a) Every subset of a regular language is a regular language
 - (b) Every subset of a nonregular language is a nonregular language.
 - (c) If A is a regular language and B is a language such that AB is regular, then B is regular.
 - (d) If A is a regular language and B is a language such that $A - B$ is regular, then B is regular.
 - (e) For any language A and its complement A' the language $A \cup A'$ is regular.