CS 154 - Introduction to Automata and Complexity Theory

Spring Quarter, 2001

Assignment #2 - Due date: Wednesday, 4/25/01

Problem 1. *(20 points)* Consider the ϵ-NFA defined in the following transition table.

	ϵ	a	b	c
$\rightarrow p$	$\{q, r\}$	$\{q\}$	$\{r\}$	$\emptyset$
q	$\{p, q\}$	$\emptyset$	$\{p\}$	$\{p, r\}$
$*r$	$\emptyset$	$\emptyset$	$\emptyset$	$\emptyset$

a). Compute the ϵ-closure of each state.
b). Convert this ϵ-NFA into an NFA using the construction described in class. You must provide the transition table of the resulting NFA.

Problem 2. *(20 points)* Provide regular expressions for the following languages over the alphabet $\Sigma = \{0, 1\}$. Provide a brief explanation as to why your regular expressions generate the given languages.
a). The set of all strings not containing 111 as a substring.
b). The set of all strings where the number of 1's is a non-zero multiple of 3.

Problem 3. *(20 points)* Consider the regular expression $(0 + 10)^*(1 + 01)^*$.
a). Provide a *succinct* description of the language defined by this regular expression.
b). Use the construction described in class to convert this regular expression into an ϵ-NFA.

Problem 4. *(20 points)* Solve Exercise 4.1.1(e) on page 129 of the textbook.

Problem 5. *(20 points)* Solve Exercise 4.1.2(b) on page 130 of the textbook. (*Hint:* Refer to the solution for Problem 4.1.2(a) at the web page
`http://www-db.stanford.edu/ ullman/ialcsols/sol4.html`.)

Reading Assignment:

In Chapter 3 of the course reader, we have covered Sections 3.1 and 3.2 in detail. But we also recommend that you read Sections 3.3 and 3.4 for background material. We have covered portions of Section 3.4 in the class.

Next, we will cover Sections 4.1, 4.2, and 4.3 in Chapter 4 of the course reader. We will only skim over the material in Section 4.4 — but we recommend that you read the main ideas in this section without getting into the technical details. Next up: Chapter 5.