Homework 2

Cpt S 317, Spring 2017

<u>Due Date:</u> February 6, 2017

<u>Total points:</u> 38

- For all questions that ask you to build an NFA, please make sure there is non-determinism somewhere in the machine. In other words, don't provide a DFA as an answer. Also, you cannot use $\epsilon-$ transitions unless I have explicitly specified $\epsilon-$NFA for the question.

- For all questions that ask you to build an $\epsilon-$NFA, please make sure there is at least one explicit ϵ transition somewhere — i.e., don't provide a regular NFA without any $\epsilon-$transition or DFA as an answer.

- For NFA or $\epsilon-$NFA questions, try to take advantage of non-determinism in the interest of keeping the design simple and elegant.

- For questions that ask you to convert a given NFA or $\epsilon-$NFA into a DFA, follow the lazy subset construction conversion procedure discussed in the class.

Also, please look at the PDF for "Rubrics" that describes performance indicators pertinent to this homework.

A digital version of this homework in PDF and the Rubrics in PDF are available at `http://www.eecs.wsu.edu/~ananth/CptS317`.

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1. (10 points)

   Build NFAs for the following two languages.

   a) The set of strings over alphabet $\{a, b, c\}$ such that the last symbol in the string has appeared before.

   b) The set of strings over alphabet $\{a, b, c\}$ such that the last symbol in the string has *not* appeared before.

   You can assume that neither of these two languages contain ϵ in them.

2. (5 points)

   (from Exercise 2.3.2.)

   Convert the following NFA into a DFA:

	0	1
$\to p$	$\{q, s\}$	$\{q\}$
$*q$	$\{r\}$	$\{q, r\}$
r	$\{s\}$	$\{p\}$
$*s$	$\emptyset$	$\{p\}$

3. (4+3 = 7 points)

   (from Exercise 2.3.3.)

   a) Convert the following NFA into a DFA:

	0	1
$\to p$	$\{p, q\}$	$\{p\}$
q	$\{r, s\}$	$\{t\}$
r	$\{p, r\}$	$\{t\}$
$*s$	$\emptyset$	$\emptyset$
$*t$	$\emptyset$	$\emptyset$

   b) Informally describe the language accepted by these finite automata.

4. (7 points)

(from Exercise 2.5.2.)

Convert the following $\epsilon-$NFA into a DFA:
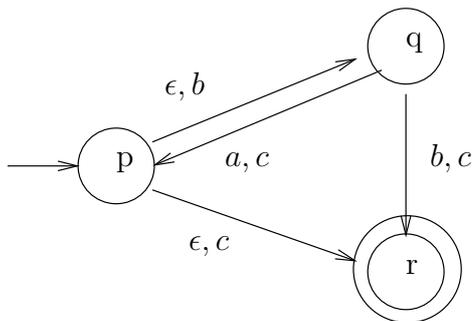
5. (from Exercise 2.5.3)

Design $\epsilon-$NFAs for the following languages of strings over the alphabets $\Sigma = \{a, b, c\}$ and $\Sigma = \{0, 1\}$ respectively:

a) (4 points)

strings consisting of zero or more a's followed by zero or more b's, followed by zero or more c's.

b) (5 points)

strings consisting of either 01 repeated one or more times, or 010 repeated one or more times.