CSE3502 - Theory of Computation January 30, 2014

Due: Before class on February 4, 2014

Homework 2

1. Did you do the reading? YES/NO/SORTA
2. Did you do the reading before class? YES/NO/SORTA
3. How long did you spend on this homework (rounding up)? _____hours.

1 Deterministic Finite Automata (DFAs)

1.1 The formal description of a DFA is $\{\{a, b, c\}, \{0, 1\}, \delta, a, \{a\}\}$, where the transition function δ is defined as

	0	1
a	b	a
b	c	a
c	b	c

- Draw the state diagram for this DFA.
- List 5 words accepted by this DFA.
- List 5 words that are rejected by this DFA.

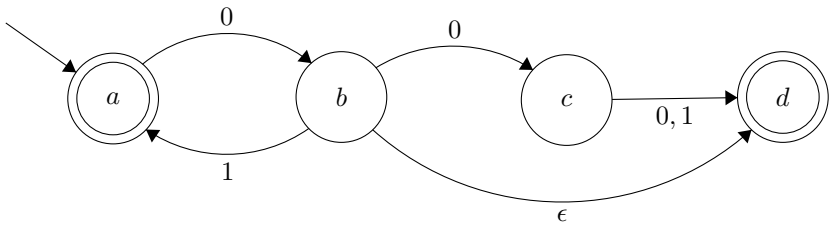
2 Nondeterministic Finite Automata (NFAs)

2.1 The formal description of an NFA is $\{\{a, b, c\}, \{0, 1\}, \delta, a, \{c\}\}$, where the transition function δ is defined as

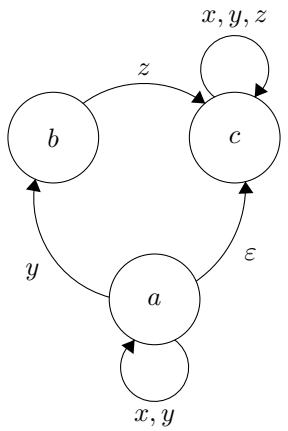
	0	1	ε
a	$\emptyset$	$\{b\}$	$\emptyset$
b	$\emptyset$	$\{c\}$	$\emptyset$
c	$\{b, c\}$	$\emptyset$	$\emptyset$

Draw the state diagram for this NFA.

2.2 Give a formal description of the following NFA.



2.3 The following NFA is not complete. Answer the following questions about it. Suppose that we know the language it accepts *is nonempty and* contains no strings with the letter z and every string it accepts contains a y. What is the start state? What is the set of accept states?



3 Regular Languages

The *complement* of a language B is the set of finite strings w over the same alphabet such that $w \notin B$.
3.1 Show that, if M is a DFA that recognizes language B, swapping the accept and nonaccept states in M yields a new DFA that recognizes the complement of B. Conclude that the class of regular languages is closed under complement.
3.2 Show by giving an example that, if M is an NFA that recognizes language C, swapping the accept and nonaccept states in M doesn't necessarily yield a new NFA that recognizes the complement of C. (Try to find a small example.) Is the class of languages recognized by NFAs closed under complement? Explain your answer.