TCS II
Formal Languages and Computability 2018/19
1st Midterm (B)

8. April 2019

Solve the assignments on your own.

Time limit is 80 minutes.

Good luck!

ASSIGNMENT	POINTS	OUT OF	ASSIGNMENT	POINTS	OUT OF
1			2		
3			4		

FIRST AND LAST NAME: _____

STUDENT ID: _____

SIGNITURE: _____

1. Assignment: (30 points)

Let's define languages:

$$L_1 = \{0^n w \mid w \text{ is an arbitrary string containing } 0\text{'s and } 1\text{'s, of length } n\}, \Sigma = \{0, 1\}$$
$$L_2 = \{w \mid a^*b(aa + c)^*\}, \Sigma = \{a, b, c\}$$

QUESTIONS:
For every language:

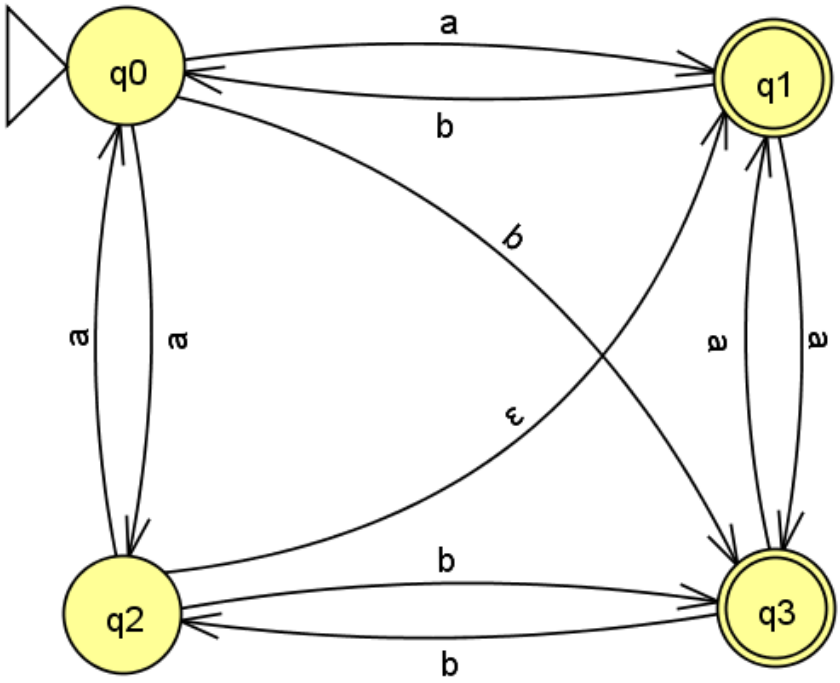
1. Find out if the language is regular or not, justify your claim!

   INSTRUCTIONS:
   If a language is regular, construct a deterministic finite automaton (DFA) – write down the complete 5-touple. If the language is not regular, you must prove that such an automaton cannot be constructed (pumping lemma for regular languages).

2. For every language, define a context free grammar (CFG) for it.

2. Assignment: (20 points)

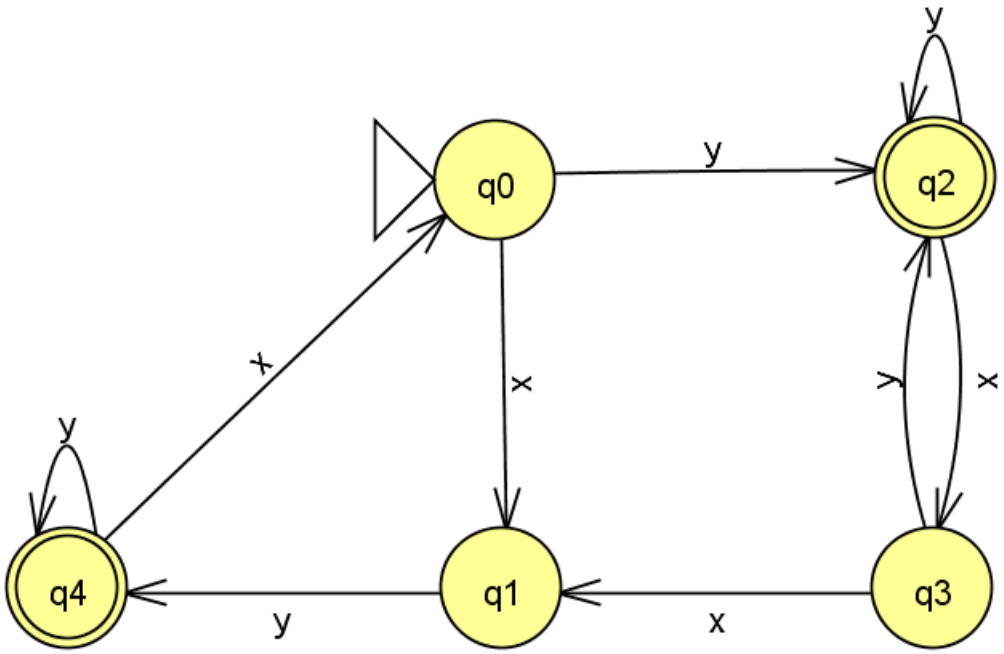
You are given the following ε-NFA:



QUESTIONS:
Transform the ε-NFA to a DFA using the procedure(s) shown in class.

3. Assignment: (25 points)

You are given the following automaton:



QUESTIONS:
Minimize the automaton using the table filling method.

4. Assignment: (25 points)

You are given the following context free grammar (CFG), $\Sigma = \{a, b, c\}$:

$S \to ABC \mid AB \mid BCD$
$A \to aaAa \mid BbA \mid \varepsilon$
$B \to A \mid bB$
$C \to Cc \mid c$
$D \to aD \mid bDc$

QUESTIONS:
Turn this grammar into Chomsky Normal Form (CNF) – write down the complete procedure.