

FLAC Assignment 5

Exercise 1 Are the following two DFAs equivalent? “ $\rightarrow$ ” and “*” is used to denote start and accept state here. Justify your conclusion.

	0	1
$\rightarrow A$	B	F
B	G	C
*C	A	C
D	C	G
E	H	F
F	C	G
G	G	E
H	G	C

	0	1
$\rightarrow A$	G	C
B	B	A
C	D	B
*D	A	D
G	B	D

Exercise 2 $\Sigma = \{0, 1\}$, build a two-way finite automaton that recognizes the following language:

$$\{w\Sigma^*w^R \mid w \in \Sigma^{100}\}$$

Try to minimize the number of states of the automata. At least how many states does a minimum DFA have for the same language?

Exercise 3 Given the following Context Free Grammar:

$$\begin{aligned} S &\rightarrow AB \mid CD \\ A &\rightarrow aA \mid \epsilon \\ B &\rightarrow bBc \mid E \mid cD \\ C &\rightarrow aCb \mid E \mid aA \\ D &\rightarrow cD \mid \epsilon \\ E &\rightarrow bE \mid b \end{aligned}$$

Please answer the following question:

1. What are the variables?
2. What are the terminals?
3. Which is the start variable?
4. Give three strings in the language.
5. Give three strings not in the language.
6. Is “aaabbcc” in the language?
7. Give a description of the language in English.

Exercise 4 Make an OBDD for the boolean function

$$x_1 \oplus x_2 \oplus x_3.$$

Hint: This is the parity function; it is true if and only if an odd number of variables are true.

Exercise 5 (bonus) Is $\{(\mathbf{d}^*\mathbf{c})^m(\mathbf{c}^*\mathbf{d})^m \mid m \geq 1\}$ a regular language? Prove your conclusion.