

# Formal Models SS 2017: Assignment 1

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Due 16.03.2017

To indicate that you solved an exercise and that you can present it in the exercise group, tick it off in our MOODLE course until **11am on the day of the exercise**.

## Exercise 1

Specify an automaton over alphabet  $\{0, 1\}$  that accepts exactly those words containing an even number of 0 and an even number of 1.

1. Graphically specify the automaton which accepts exactly the words described above.
2. Formally specify the automaton as a 5-tuple, including all of its components.

## Exercise 2

Specify an automaton over the alphabet  $\{a, b, c\}$  which accepts the words of the language with the following properties:

- (1) a word ends with at least two  $b$
- (2) symbol  $a$  is always followed by an odd number of  $c$
- (3) there are no other restrictions on the words

Examples:  $bb, acbb, baccbbcbacbbb, \dots$

1. Graphically specify the automaton which accepts exactly the words described above.
2. Is the automaton deterministic?
3. Is the automaton complete?

### Exercise 3

Draw an FA  $A$  with input-alphabet  $\Sigma := \{a, b\}$  having *exactly* 3 states such that...

1. ... $A$  is non-deterministic and incomplete.
2. ... $A$  is deterministic and incomplete.
3. ... $A$  is non-deterministic and complete.
4. ... $A$  is deterministic and complete.

Justify each of your solutions.

### Exercise 4

Show the product automaton of  $A_1$  and  $A_2$  shown below.

