Exercise 1

Given the finite automaton (FA) $A_1$ as shown on the right. Specify $A_1$ formally as a 5-tuple, including all of its components. Is $\varepsilon \in \mathcal{L}(A_1)$, $bbbabb \in \mathcal{L}(A_1)$ and $babb \in \mathcal{L}(A_1)$?

Exercise 2

Specify an automaton which describes the (simplified) structure of valid method signatures in Java-like programming languages according to following specification:

1. optional modifier public, private, protected
2. return type void or data type
3. method name
4. parameter list in brackets which can either be empty or which can contain multiple “data-type parameter-name”-pairs separated by a comma.

For simplification, we consider only data types Object, int, and boolean. Method names and parameter names are strings consisting of letters a, b, c and numbers 1, 2. The first symbol of a name is a letter. White spaces do not have to be considered.

Examples:

- public void abcl (Object a, boolean b)
- Object bb ()
Exercise 3

Given an automaton over the alphabet \{a, b, c\} which accepts the words of the language in which each a is followed by b and b is followed by an even number of c (at least by two c). Examples: \(\varepsilon\), c, cc, abcc, cabccce, abccabcc, ...

Specify this automaton graphically and as 5-tupel.

Exercise 4

Let \(P_3 := A_3 \times A_4\) be the product automaton of FA \(A_3\) and FA \(A_4\) as shown on the right. Draw \(P_3\) and fully specify it formally as a 5-tuple. Find three words \(w\) with \(w \in L(P_3)\). What is the maximum number of states \(P_3\) can have in theory? Justify your answers.