Lund University
Computer Science
Lennart Andersson

Seminar 1
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Problems

These problems will be discussed on seminar 1. Programs in Haskell are not required to compile.

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1 Let $A = \{\, a, b, c \,\}$ and $B = \{\, 0, 1 \,\}$ be languages. Describe the following languages: $A \cdot B, A \cup B, B^3, A^*, A(A \cup B)^*, \emptyset^2, \emptyset^*$.

2 Find all languages L such that L^* has a finite number of strings.

3 Find all languages L such that $L = \{\, \epsilon \,\} \cup (\{\, a \,\} \cdot L)$.

4 Find a regular expression denoting the language $\{\, \epsilon \,\}$ without using ϵ.

5 Define an abstract representation for regular expressions using Haskell or Java.

6 Sometimes the language of regular expressions is extend with $[\alpha]$ meaning that the string correspondingly to α occurs or is missing and $\alpha+$ meaning that one or more strings corresponding to α is present. Define $\mathcal{L}$ for the extended language.

7 Define a concrete grammar for concrete grammars, i.e. the grammar should show how to write productions and a complete grammar. You may assume that *terminal* and *nonterminal* are nonterminal symbols defined elsewhere and that there are no alternatives and repetitions in the right hand parts.

8 Define an abstract representation for concrete grammars using Haskell or Java.