Informatik and Mathematical Modelling 2/10 04
DTU MRH

02140 Languages and Parsing
Programming Exercise 5

In this exercise you shall extend the programs for regular expressions available on the homepage of the course in connection with the lecture on Monday, October 4.

1. Declare a function `alph` to extract the alphabet (a list of strings without repetitions) from a regular expression.
2. Complete the functions (a) `isEps`, (b) `isF` and (c) `isI` (all of type `reg -> bool`), to decide whether the language of a regular expression is (a) $\{\epsilon\}$, (b) is finite, and (c) is infinite.
3. Complete the function `reverse: reg -> reg` satisfying:

   $$L(\texttt{reverse}(r)) = (L(r))^R$$

   See Section 4.2.2.
4. Complete the declaration of the function `red` which can simplify regular expressions using some of the algebraic laws of Section 3.4.
5. Complete the declaration of the function `dfaToReg` to transform a DFA to a regular expression. Assumed that the states of the DFA are natural numbers $1, \ldots, n$, where n is the number of states. Base the declaration on the R_{ij}^k construction in Section 3.2.1.
6. Declare functions to solve decision problems for languages of DFAs corresponding to the decision problems for regular expressions given in problem 2. above.