

CS 334 Fall 2021: Problem Set 3.

Problem 1. (20 points) Give regular expressions to generate each language below:

a. $\{w \in \{0,1\}^* : w = \alpha \circ \beta, \alpha \text{ has an even number of } 1\text{'s and } \beta \text{ has an even number of } 0\text{'s}\}$

b. In some programming languages, comments appear between delimiters such as `/#` and `#/`. Let C be the language of all valid delimited comment strings. Each member of C must begin with `/#` and end with `#/` but have no intervening `#/`. For simplicity, let the alphabet be $\{a, b, /, \#\}$. Give a regular expression to describe C . (You may assume that each string in C contains at least 4 symbols.)

Problem 2. (15 points) Prove that the reverse of every regular language is regular. Your proof should use only regular expressions and should not mention DFAs or NFAs. In other words, show that for every regular expression R_1 there is another regular expression R_1^{-1} such that $\mathcal{L}(R_1^{-1}) = \mathcal{L}(R_1)^R$. (Hint: the set of all regular expressions is defined inductively.)

Problem 3. (15 points) Apply the DFA minimization algorithm to the DFA shown below. Show the matrix of distinguishable pairs of states after each iteration of the loop.

