

Exercise Set 3

Due by 4:00 p.m. on Tuesday, October 23

Exercise 1 (45 points)

Let $X = \{w \in \{0, 1, 2\}^* \mid \text{for all substrings } x \text{ of } w, \text{ if } |x| = 2, \text{ then } x \in \{01, 12, 20\}\}$.

(a) Find a regular expression α such that $L(\alpha) = X$. [15 points]

(b) Prove that your answer to (a) is correct. [30 points]

Exercise 2 (55 points)

Let $X = \{w \in \{0, 1\}^* \mid \text{for all } x, y \in \{0, 1\}^*, \text{ if } w = x00y, \text{ then } 11 \text{ is a substring of } y\}$.

(a) Find an FA M such that $L(M) = X$ and M has as few states as possible, i.e., for all FAs N , if $L(N) = X$, then $|Q_N| \geq |Q_M|$. [15 points]

(b) Use Forlan to provide some evidence that $L(M) = X$, making use of some test cases that are in X , as well as some that are not in X . For the positive test cases, generate and display minimum-length labeled paths showing why the strings are accepted by M . (Include a transcript of your Forlan session.) [10 points]

(c) Prove that your answer to (a) is correct. [30 points]