Subiecte 2

July 4, 2022

Exercise 1 (25p)**.** *Use the pumping lemma to show that the following languages are not regular*

1. $A_1 = \{0^n 1^n 2^n | n \geq 0\}$
2. $A_2 = \{www | w \in \{a, b\}^*\}$
3. $A_3 = \{a^{2^n} | n \geq 0\}$ *(Here, a^{2^n} means a string of 2^n a's.)*

Exercise 2 (25p)**.** *Convert the following regular expressions to NFAs using the procedure given in Theorem 1.54 (see Sipser 1.3 or Lecture 5). In all parts* $\Sigma = \{a, b\}$

1. $a(abb)^* \cup b$
2. $a^+ \cup (ab)^+$
3. $(a \cup b^+)a^+b^+$

Exercise 3 (100p)**.** *Determine if the following language is context-free: the set of words over a 4-letter alphabet that contain an abelian square*