Discrete Mathematics

368.115

Exercise sheet 5 for November 4, 2016

We will also discuss problem 5 of sheet 3 and problem 5 of sheet 4.
Solve 2 out of the following 3 problems.

(1) Let L_1 and L_2 be the languages over $\{a\}$ defined by

$$\begin{aligned} L_1 &:= \{a^n \mid n \equiv 2 \pmod 3\}, \\ L_2 &:= \{a^n \mid n \equiv 4 \pmod 6\}. \end{aligned}$$

Design NFA's that recognize L_1, $L_1 \cap L_2$, and $L_1 \cup L_2$.

(2) For the language $L_2 := \{a^n \mid n \equiv 4 \pmod 6\}$, design an NFA recognizing $(L_2)^3 = \{xyz \mid x, y, z \in L_2\}$ and an NFA recognizing $(L_2)^*$.

(3) Let L be a recognizable language. Must $\{\underbrace{xx\ldots x}_{n} \mid x \in L, n \in \mathbb{N}\} = \{x^n \mid n \in \mathbb{N}, x \in L\}$ be recognizable?