

COSC 3431.03

S. 1999

Date: May 11, 1999

Due: June 1, 1999—In class, no extensions

Problem Set No. 1

General Remark. Each problem must have *adequate explanation* of why it answers the relevant question. While examples can help to understand your point of view, *they are NO substitutes* for an argument (this may be a “proof”) that your answer is general and “works in all cases”.

In particular, in problem 1 below, an answer that consists of an automaton and a few examples is unacceptable.

1. Develop an FA over the alphabet $\Sigma = \{0, 1, 2, 3\}$ that accepts exactly those strings that if they are interpreted as natural numbers in base-4 notation, they are divisible by 3.
2. From the text (Sipser) do:
 - p.84, #1.4(b), #1.5(a);
 - p.85, #1.10, #1.12(b);
 - p.86, #1.16(b), #1.17(c);
 - p.88. 1.23(d).
3. Let for any string x over $\Sigma = \{0, 1\}$ x^R mean its reversal (i.e., x^R reads right-to-left exactly as x does left-to-right).
 - (a) Is $\{xwx^R : x \in \Sigma^* \ \& \ w \in \Sigma^*\}$ regular?
Why “yes” or why “no(t)”?
 - (b) How about $\{xwx^R : x \in \Sigma^* \ \& \ w \in \Sigma\}$?
Why “yes” or why “no(t)”?