

Formal Languages Homework 1

Liam Dillingham

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1 Problem 2.2.4

Give DFA's accepting the following languages over the alphabet $\{0, 1\}$:

- 1.1 a). The set of all strings ending in 00.
- 1.2 b). the set of all strings with three consecutive 0's (not necessarily at the end)
- 1.3 c). The set of strings with 011 as a substring

2 Problem 2.2.5

Give DFA's accepting the following languages over the alphabet $\{0, 1\}$.

- 2.1 a). The set of all strings such that each block of five consecutive symbols contains at least two 0's.
- 2.2 b). The set of all string whose tenth symbol from the right end is a 1.
- 2.3 c). The set of strings that either begin or end (or both) with 01.
- 2.4 d). The set of strings such that the number of 0's is divisible by five, and the number of 1's is divisible by 3.

3 Problem 2.2.7

Let A be a DFA and q a particular state of A , such that $\delta(q, a) = q$ for all input symbols a . Show by induction on the length of the input that for all input strings w , $\hat{\delta}(q, w) = q$.

4 Problem 2.2.8

Let A be a DFA and a a particular input symbol of A , such that for all states q of A we have $\delta(q, a) = q$.

- 4.1 a). Show by induction on n that for all $n \geq 0$, $\delta(q, a^n) = q$, where a^n is the string consisting of n a 's.
- 4.2 b). Show that if x is a nonempty string in $L(A)$, then for all $k > 0$, x^k (i.e., x written k times) is also in $L(A)$.