

## Problem Set 5

*Instructor: Daniele Micciancio***Due on:** Thu. March 11, 2010

**Guidelines:** You don't need to use JFLAP for this assignment. Just write down your solutions as a single pdf file, and submit it using turnin.

**Note:** The assignment contains just two problems (one Turing reduction, and one map reduction), which will be used to assign you a grade. You are encouraged to work on more problems in order to prepare for the final exam. You can find many more problems on reductions in Chapter 5 of the textbook. Try to solve them, and if you have any question, bring them to class, discussion or office hour.

## Problem 1

Let  $\text{Pal} = \{w \in \{0,1\}^* : w^r = w\}$  be the set of all palindromes over the alphabet  $\{0,1\}$ . Consider the problem of determining if a Turing machine accepts only palindromes. Prove that the corresponding language

$$L = \{\langle M \rangle : M \text{ is a TM with alphabet } \{0,1\} \text{ such that } \mathcal{L}(M) \subseteq \text{Pal}\}$$

is undecidable.

## Problem 2

Let  $L$  be the set of all strings of the form  $\langle M, T \rangle$  where  $M$  is a DFA,  $T$  is a Turing machine, and  $\mathcal{L}(M) \subseteq \mathcal{L}(T)$ . Give a map reduction from  $L$  to  $\text{ALL}_{\text{TM}}$ .