

Homework 7

Due Date: Wednesday, April 4, 2008.

There is a possible 38 points for this homework assignment.

Problem 1. (20 pts.) Draw a transition diagram for a Turing machine accepting each of the following languages.

1. $\{a^i b^j \mid i < j\}$
2. $\{x \in \{a, b, c\}^* \mid n_a(x) = n_b(x) = n_c(x)\}$
3. The language of balanced strings of parentheses.
4. The language of all nonpalindromes over $\{a, b\}$
5. $\{ww \mid w \in \{a, b\}^*\}$

Problem 2. (3 pts.) Describe the language (a subset of $\{1\}^*$) accepted by the TM distributed in class.

Problem 3. (2 pts.) We do not define ϵ -transitions for a TM. Why not? What features of a TM make it unnecessary or inappropriate to talk about ϵ -transitions.

Problem 4. (5 pts.) Describe how can one construct TM T' from TM T such that $L(T) = L(T')$ and T' never crashes.

Problem 5. (8 pts.) Draw a TM that computes the indicated function. Since both of these functions are from \mathbb{N} to \mathbb{N} you should use unary notation.

1. $f(x) = x + 2$
2. $f(x) = 2x$

Problem 6. (5 pts. Extra Credit) Draw a TM that computes $f(x) = x^2$