

CS U390, Spring 2007 (Instructor: Clinger)

Homework 4

Assigned: Thursday, 22 February 2007

Due: Thursday, 1 March 2007

This is a programming assignment. For each of the problems, you will specify a Turing machine that recognizes a certain language. Your specifications of the Turing machines must be in the form expected by the instructor's Turing machine interpreter, and you should use the instructor's interpreter to test your machines.

You will submit your Turing machine specifications by email, following the instructions shown on the course web site.

Good students should get at least 30 of the 50 possible points.

1. [5 pts] Define a Turing machine named `m1` that recognizes $\{0^n \mid n \geq 0\}$.

2. [5 pts] Define a Turing machine named `m2` that recognizes

$$\{w \mid w \in \{0, 1\}^* \text{ and contains an odd number of 0s}\}$$

3. [5 pts] Define a Turing machine named `m3` that recognizes

$$\{w \mid w \text{ is a binary numeral that is divisible by 3}\}$$

4. [5 pts] Define a Turing machine named `m4` that recognizes

$$\{w \mid w \in \{0, 1\}^* \text{ and contains at least twice as many 0s as 1s}\}$$

5. [5 pts] Define a Turing machine named `m5` that recognizes

$$\{0^n 1^n \mid n \geq 0\}$$

6. [5 pts] Define a Turing machine named `m6` that recognizes

$$\{ww^R \mid w \in \{a, b\}^*\}$$

7. [5 pts] Define a Turing machine named `m7` that recognizes

$$\{a^i b^j c^k \mid 0 \leq i \leq j \leq k\}$$

8. [5 pts] Define a Turing machine named `m8` that recognizes

$$\{ww \mid w \in \{a, b\}^*\}$$

9. [5 pts] Define a Turing machine named `m9` that recognizes

$$\{1^n 01^k \mid n \geq 0, k \geq 1, \text{ and } k \text{ is a divisor of } n\}$$

10. [5 pts] Define a Turing machine named `m10` that recognizes

$$\{1^p \mid p \text{ is a prime number}\}$$