CS 3800
Homework 4
Assigned: Tuesday, 9 March 2010
Due: Tuesday, 16 March 2010

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 following the instructions shown on the course web site.

Good students should get at least 25 of the 50 possible points.

1. [5 pts] Define a Turing machine named `m1` that recognizes $\{0^i 1^j \mid i, j \geq 0\}$.
2. [5 pts] Define a Turing machine named `m2` that recognizes
$$\{w \mid w \in \{0,1\}^* \text{ and contains an even number of 1s}\}$$
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
$$\{ww^{\mathcal{R}} \mid w \in \{a,b\}^*\}$$
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
$$\{1^i 0 1^j 0 1^k \mid i + j = k\}$$
10. [5 pts] Define a Turing machine named `m10` that recognizes
$$\{1^n 0 1^k \mid n \geq 1,\ k \geq 0, \text{ and } n \text{ is a divisor of } k\}$$