

## Problem Set 7 – Due Friday, May 16, 2014

**Instructions.** *For this problem set, please work in teams of 2–3 people.*

**Problem 1.** Design a Turing machine that decides the language  $L = \{x\#y : x, y \in \{0, 1\}^+ \text{ and } x \text{ and } y \text{ are equal-length strings that differ on a single character}\}$ . For example, 010#011 and 1111#1011 are in  $L$ , while 010#111, 1111#111, #, and 11##01 are not. If the input string is in  $L$  your TM must leave the tape blank except for a 1; if the input string is not in  $L$ , it must leave the tape blank except for a 0. Rather than following the conventions of your book, please employ those of the website <http://morphett.info/turing/turing.html>. In particular, you'll assume a two-way infinite tape. Try to make your program use as few rules as possible, measured by the number of 5-tuples that you need. Test your machine on plenty of inputs. A prize will go to the smallest correct machine.

Submit your solution, one per group, by **10:40 am**, in the SmartSite Drop Box. The solution must be in the runnable format of the website above. The TA will test it on various inputs of his/her choosing. A comment at the top of your program must list the names of the team members, in alphabetical order by last name; and the number of rules you used. Please use the Drop Box of the **alphabetically-first** student in your group (alphabetical by last name, of course). Please do **not** put your solution in the Drop Box of any other student in the group.