Assignment 6

CSI 4336

Due October 27, 2016

Submitting your assignment

All written portions of the assignment should be prepared in \LaTeX.

Submit this assignment on the due date in two ways: by email (before class) and in hardcopy (at the beginning of class). The printed copy should not contain any programming code. Proofread your document for style before submitting it.

Send the email to hamerly@cs.baylor.edu with the subject “CSI 4336 assignment X”, where X is the assignment number (e.g. 0). The email should have one attachment (in plain text, .zip, or .tar.gz format) containing:

- the \texttt{.tex} document you wrote named “lastname.tex” (where ‘lastname’ is your last name),
- any additional files used in your \LaTeX\ document, named “lastname_fig1.pdf” (or similar), and
- all source code used for any programs.

Textbook exercises (10 points each, 40 points total)

1. Do problem 5.9 from your textbook. Do not use Rice’s theorem in your proof; instead, use a reduction.

2. Do problem 6.23 from your textbook (note: this is 6.22 in the second edition). Hint: you could use a reduction for this problem (as usual), but it is much easier to prove if you consider what you would be able to do if $K(x)$ was computable, along with the idea that some strings of every length are incompressible (Theorem 6.29).

3. Do problem 6.21 from your textbook (note: this is 6.20 in the second edition). However, modify the problem – instead of using an oracle for $A_{TM}$, use an oracle for $HALT_{TM}$ (this makes the problem easier).

4. Consider the languages $HALT_{TM}$ (from Theorem 5.1) and $E_{TM}$ (from Theorem 5.2). Prove the following statement:

$$E_{TM} \leq_T HALT_{TM}$$