CSE 4083/5210 Formal Languages and Automata

`asgn09` Assignment #9 Chapter 9 (CE/TM)

Due: Fri, 15 Mar 2024

**Reading.** Read Chapter 9: "Turing Machines." An on-line simulator

`http://math.hws.edu/eck/js/turing-machine/TM.html`

for TM is useful. So to "design a Turing Machine" requires providing a JSON file for this TM simulator.

More about the Church-Turing Thesis can be found at the Stanford Encyclopedia of Philosophy.

**Assignment.** Do some of the following exercises.

- Section 9.1: Problems **1**, 2, 3, **4**, 5, 6, 7, 8a**b**cde**f**gh

  The TM diagram in problem 6 has a mistake. State $q_0$ goes to state $q_2$, not the other way around.

We are especially interested in clear exposition and proof technique. (Some solutions sketches are in the back of the book.)

**Submission.** Write up the solutions. You may use pen and paper, plain text, or LaTeX. Produce a PDF document, and submit it on Canvas by the due date before the end of the day.

The due date is for the completed problem set. You should read the material in advance, and start thinking and working on the problems in advance, so that you can ask questions in class.

Collaborating is encouraged; no individual grade for the homework will be used in determined the individual course grade (that's what the tests are for). Copying just wastes everyone's time; it is quality that is important not quantity. Copying is not practicing. Of course, some individual may require much more practice than others to achieve the same level of competency on the tests.

**Questions.** If you have questions about how to do the problems, you are welcome to send me e-mail: `ryan@fit.edu`. Students may be called upon to share and explain their progress on the exercises during class.

**Assessment.** Ultimately the written proofs, your choice of exercises, and your participation in answering and *asking* questions, will influence your course grade.

**Objectives.**

1. (§9.1) Know the standard Turing machine model
2. (§9.1) Perform the steps of a Turing machine given a sample input string
3. (§9.1) Determine whether an input string is accepted by a Turing machine
4. (§9.1) Construct a Turing machine to accept a specific language
5. (§9.1) Define a Turing computable function (Linz 6th, Definition 9.4, page 243)
6. (§9.2) Know how to combine transducers
7. **(§9.3) State Turing's thesis and understand the arguments for it**