

CSE 4083/5210 Formal Languages and Automata
asgn10 Assignment #10 Chapters 9 & 10 (CE/TM)
Due: Fri, 22 Mar 2024

Reading. We continue covering Chapter 9, adding §9.2 and §9.3. Due to the nature of the material there are few practice problems. Spring break is next week. We probably won't get into Chapter 10 much.

Assignment. Do some of the following exercises.

- Section 9.2: Problems 5, 8, p
- Section 9.3: What is the statement of Church-Turing thesis? Why is it not provable?
- Section 10.1: Problems 1, 2, 3a, 4, 5, 6

These problems concern formalization. All scientists formalize stuff. In the software development process people who make specifications are formalizing, abstracting, and encoding the problem—though perhaps loosely and without precision (informally!).

- Section 10.2: Problems 1abcdef
- Section 10.3: Problems 2abcde
- Section 10.4: Problems 1, 2
- Section 10.5: Problems 1abcdefghi.

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, a plain text, or \LaTeX . Produce a PDF document, and submit it on Canvas.

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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 determining 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. (§10.1) Explain the concept of equivalence between classes of automata
2. (§10.1) Describe how a Turing machine with a stay-option can be simulated by a standard Turing machine
3. (§10.1) Describe how a standard Turing machine can be simulated by a machine with a semi-infinite tape
4. (§10.1) Compare multi-track Turing machines with standard Turing machines
5. (§10.2) Describe how multi-tape, and multidimensional Turing machines can be simulated by standard Turing machines
6. (§10.3) Describe the operation of nondeterministic Turing machines and their relationship to deterministic Turing machines. Thm 10.2: TM = nondeterministic TM
7. (§10.4) Describe the components of a universal Turing machine
8. (§10.4) Define countable sets (page 278)
9. (§10.4) Define enumeration by a Turing machine (Def 10.4)
10. Describe encoding and decoding tuples, lists, strings, and Turing machine
11. (§10.5) Describe the operation of linear bounded automata and their relationship to TMs. [CSLs defined by grammars in §11.3, Def 11.5, page 300.]