COMP 4200 - Formal Languages: Homework #7

Due on Monday, April 24, 2023, at 10:00 pm
Instructor: Hugh Kwon

Instructions:

- Submit your work as a single PDF through GradeScope (link on Canvas). You will need to mark your solution to each question (click for the instruction).
- Note that it is your responsibility to make your submissions readable by TAs. If your handwriting is not readable by the TA, he may not give you full credits (or any credits at all) for the illegible part.
- You will not only be graded on your mathematics, but also on your organization, proper use of English, spelling, punctuation, and logic.
- Late submissions will NOT be graded unless as specified by the Late Assignment Submission policy in the syllabus.
- For any questions regarding the assignment or grading of the assignment, please email our TAs.

Problem 1

Total: 40 points (10 points each)
Draw the state-transition diagram for a Turing Machine M that *decides* each of the following languages. That is, M is supposed to accept all strings in the language and reject all strings not in the language, but it can never loop forever on any input (your TM **must** halt)! Assume that the input alphabet is $\Sigma = \{0, 1\}$ and the tape alphabet $\Gamma = \Sigma \cup \{\sqcup\}$, where $\sqcup$ is the blank symbol.

1. $A = \varnothing = \{\}$
2. $B = \{\epsilon\}$
3. $C = \{0\}$
4. $D = \{1\}^*$

Problem 2

Total: 30 points
Show a Turing Machine M that decides the following language.

$$E = \{yy \mid y \in \{0, 1\}^*\}$$

1. Describe in English the idea of how it works. **15 points**
2. Show all the transitions by drawing the state diagram (label all states!). **15 points**