Midterm Exam

CSE 30151 Spring 2020

2020/09/24

Instructions

- This exam has six questions, worth 20 points each, for a total of 120 points (20% of your grade).
- Time
  - You have from 09/23 5pm to 09/25 5pm to write your solutions.
  - Late submissions will receive a 10% penalty per day.
  - Partial submissions are not allowed.
- Allowed sources
  - You **may** use the textbook, lectures, videos, and lecture notes for this course. Please cite your source only if you need to use a definition or proof and don't want to re-define or re-prove it.
  - You **may not** communicate with any people (inside or outside the class) about any topic related to this exam.
  - You **may** use sources other than the ones listed above. Please cite all sources that contributed substantially to your solution. You **may not** copy or quote from these sources.
- Please post clarification questions as private questions on Piazza.
- Please create a single PDF file containing your solutions.
  - You can write your solutions by hand, but please scan them to convert them to PDF.
  - Please don't put any identifying information in the file, so that we can grade the exams blind.
- Please submit your PDF in Sakai under the assignment "ME."

Problems

Exercise/problem numbers are from the US edition; if someone tells me the international edition numbers, I will add them.

1. Design a DFA or NFA. Book problems: 1.4–7.
2. Design a regular expression. Book problems: 1.18.
3. A proof about regular languages. Book problems: 1.11 (single accept state), 1.31 (intl. 1.46), 1.40a (intl. 1.45a), 1.44 (intl. 1.34), 1.66a (intl. 1.60a).
4. Prove that a language is not regular. Book problems: 1.46abc.
5. Prove that the same language is context-free by writing a CFG *or* PDA for it. Book problems: 2.4–6.
6. A proof about context-free languages. Book problems: 2.16 (regular operations), 2.25 (*SUFFIX*), 2.44 ($\diamond$).

   Rejected question: A k-PDA is a PDA whose stack must always be at most k symbols high. That is, in the definition of a PDA computation at the top of page 114, for each $i = 1, \ldots, m$, we have $|s_i| \leq k$. Prove that every k-PDA recognizes a regular language.