CS 3100, Spring 2020, Assignment 9 – 100 pts total – Due Dates on Syllabus

Pertinent files are kept in `18_More_TM_Exs/ASSIGNMENT-9/`.

1. (XL, 25%) Please do Problem 6, OR case, Page 159 (show it is a CFL for "OR" by designing a CFG and then building a PDA that simulates it). Do your work inside `u1234567_Asg9.ipynb`. Run the nine (9) tests already given in `u1234567_Asg9.ipynb`, plus add five (5) more tests of your own after the given nine tests.

2. (SV, 25%) Please do Problem 6, AND case, Page 159 (show it is not a CFL, by writing a neat PL proof within `u1234567_Asg9_Prob1234.ipynb`, in the space provided, using mathematical notations (Latex markdown).

3. (AR, 25%) In the space provided within `u1234567_Asg9_Prob1234.ipynb`, design a deterministic Turing machine (DTM) over the input alphabet $\Sigma = \{0, 1, \#\}$ for the language of all strings of the form $w\#x$ where $w, x \in \{0, 1\}^*$. You must design a **deterministic** Turing machine which absolutely has no non-determinism anywhere in its state transitions. A deterministic algorithm here requires searching for all w-beginnings within x. A correct design will have a deterministic polynomial runtime.

4. (LT, 25%) In the space provided within `u1234567_Asg9_Prob1234.ipynb`, design a nondeterministic Turing machine (NDTM) over the input alphabet $\Sigma = \{0, 1, \#\}$ for the language of all strings of the form $w\#x$ where $w, x \in \{0, 1\}^*$. You must design a **non-deterministic** Turing machine—*i.e.*, not design a DTM and call it an NDTM. You must employ a distinct phase of taking a guess (indicating it via your comments) and check the guess. A correct design will have a nondeterministic linear runtime.