HW2

Due: September 28, 2021 at 10:20 ET

Reminder: Your name should not appear anywhere on your handin; each individual page of the homework should include your Banner ID only. For your digital submission, each page should include work for only one problem (i.e., make a new page/new pages for each problem).

While collaboration is encouraged in this class, please remember not to take away notes from any labs or collaboration sessions, and to list your collaborators at the beginning of your homework submission.

Please monitor Piazza, as we will post clarifications of questions there. Hand in your solutions by 10:20am to Gradescope. See the course syllabus for the late policy.

Problem 1

(a) Convert the following two NFAs to equivalent DFAs.

Hint: Use the construction given in Theorem 1.39 from the textbook.

(b) Give a regular expression generating the language. \(\{ w \mid w \text{ contains at least } 3 \text{ 1s }\} \) over \(\Sigma = \{0,1\}\).
Problem 2

Convert the following regular expressions to NFAs using the procedure given in Theorem 1.54. In all parts, $\Sigma = \{a, b\}$.

(a) $a(abb)^* \cup b$

(b) $(a \cup b^*)a^* b^*$

Problem 3

Let $\Sigma = \{0, 1\}$ and let:

$$D = \{ w \mid w \text{ contains an equal number of occurrences of the substrings 01 and 10} \}$$

Thus $101 \in D$ because 101 contains a single 01 and a single 10, but $1010 \notin D$ because 1010 contains 2 10s and 1 01. Show that $D$ is a regular language.