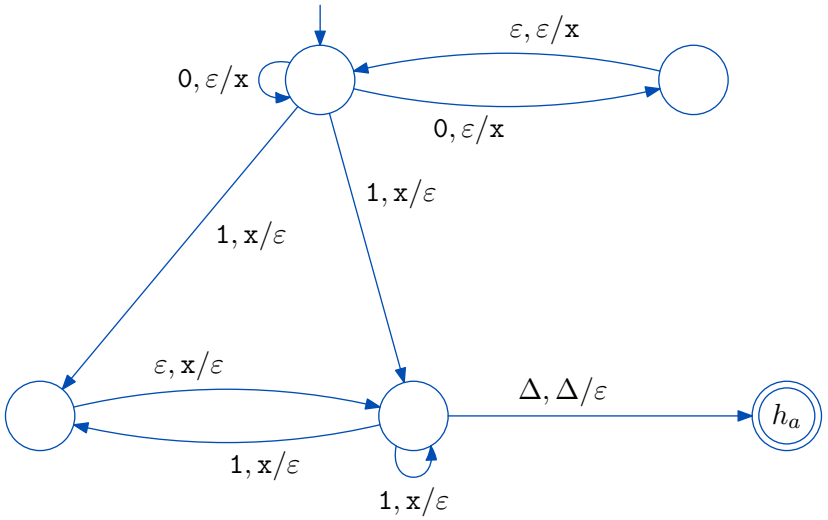
CpSc 3500 — Goddard — Fall24

Assignment 5

(Please work in groups of two or three and submit one answer sheet for the group.)

1. Give a regular grammar for the language of all nonempty binary strings that do **not** contain 000.

2. What language does this PDA accept? Be precise.



3. (a) Describe in English how to build a PDA for the complement of $\{0^n 1^n : n \geq 0\}$.
   (b) Draw the resultant PDA.

4. Suppose we have a language L with alphabet $\{0, 1\}$ and two fixed strings s_0 and s_1 from some other alphabet. Then for any binary string w, the string $f(w)$ is defined by replacing each 0 by s_0 and each 1 by s_1. For example if $s_0 = \texttt{xy}$ and $s_1 = \texttt{yyy}$, then $f(001) = \texttt{xyxyyyy}$. Then the language L^f is defined by $L^f = \{f(w) : w \in L\}$.

   (a) Show that if L is context-free, then so is L^f.

   (b) Show by example that L^f can be context-free even if L is not.

5. Define a 2-PDA like a PDA except that it has two stacks; similarly a 3-PDA.
   (a) Give one language that is accepted by some 2-PDA but not by any PDA.
   (b) Explain how to simulate a 3-PDA using a 2-PDA.

Due: Friday October 11