CSCI 340 — Homework 8

Dr. Schwartz

1. Find CFGs that generate the following regular languages. Assume $\Sigma = \{a \;\; b\}$
   (a) All strings that end in b and have an even number of b's in total
   (b) All strings without the substring aaa
2. For the following CFG, find a regular expression that defines the language. Also describe the language.

   $S \to aS \mid bX \mid a$

   $X \to aX \mid bY \mid bZ \mid a$

   $Y \to aY \mid a$

   $Z \to aZ \mid bW$

   $W \to aW \mid a$
3. Starting with the alphabet $\Sigma = \{a \;\; b \;\; (\;\;) \;\; + \;\; *\}$, find a CFG that generates all regular expressions. Is this language regular?
4. Find a regular form of the following CFG:

   $S \to XY$

   $X \to aX \mid Xa \mid a$

   $Y \to bY \mid b$
5. Remove all Λ-productions from the following CFG:

   $S \to XaX \mid bX$

   $X \to XaX \mid XbX \mid \Lambda$
6. Remove all unit productions from the following CFG:

   $S \to aX \mid Yb$

   $X \to S$

   $Y \to bY \mid b$
7. Convert the following CFG to CNF

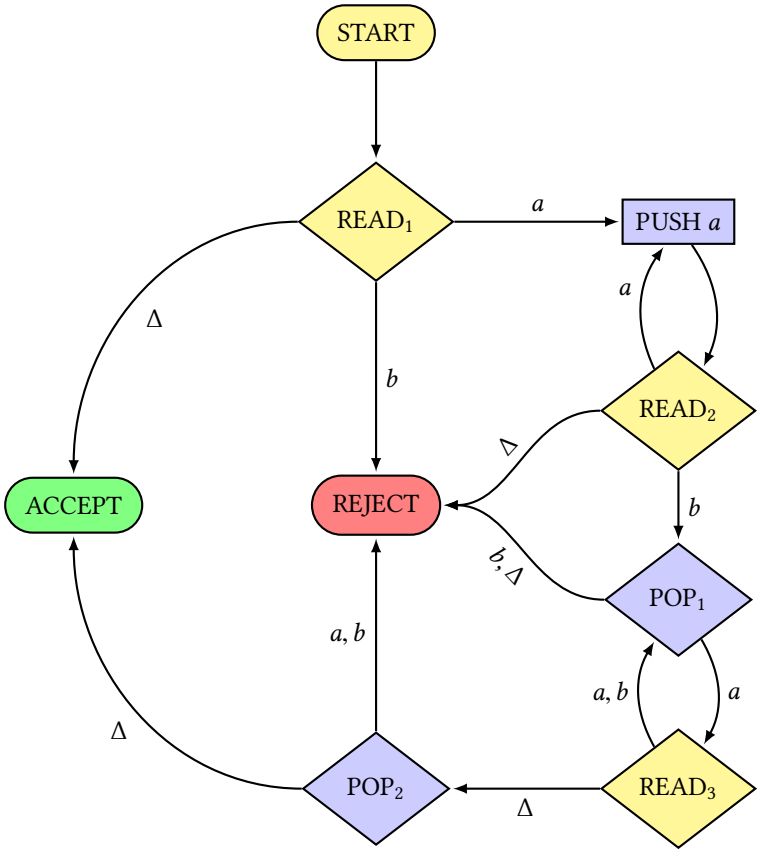
   $E \to E + E$

   $E \to E * E$

   $E \to (E)$

   $E \to 7$

8. Create a PDA for EVEN-EVEN (even number of a's and b's in any order)
9. Build a deterministic PDA that accepts the language $a^n b^{n+1}$ (Assume $n > 0$)
10. Consider the following PDA (Assume $\Sigma = \{a \;\; b\}$



(a) Trace the following words on the PDA (show STACK and TAPE and STATE)
aaabbb and *aaaabb*

(b) Find a CFG that defines the language accepted by the PDA

(c) Describe the language in English