CS510 Fall 2021 Assignment #2

1) Give regular expression generating the language: **Exercise 1.18**.
2) Convert RE to NFA: **Exercise 1.19(a)** (use JFLAP to draw the automaton)
3) Convert FA to RE: **Exercise 1.21(b)**
4) Use Pumping lemma to show the language is not regular: **Exercise 1.29(b)**
5) Show that the language is regular: **Exercise 1.36**
6) Give CFG that generates the language. **Exercise 2.4 (b), (c), (e), (f).**

   Note 1: CFG is a 4-tuple (V, Σ, R, S). You need to explicitly state what V is, what Σ is, what rules are in R, and what S is.

   Note 2: You may create your grammar on JFLAP and test it on multiple inputs to make sure it works.
7) **Convert the following DFA into an equivalent CFG**:
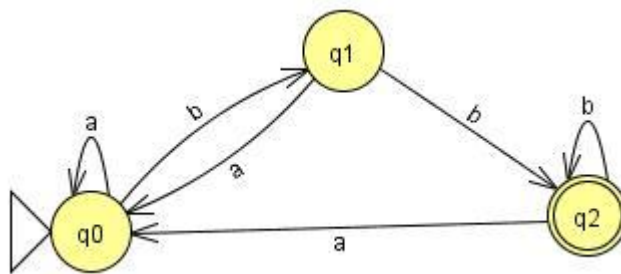
   Note: CFG is a 4-tuple (V, Σ, R, S). You need to explicitly state what V is, what Σ is, what rules are in R, and what S is.

8) Convert CFG to CNF: **Convert the following CFG into an equivalent CFG in Chomsky normal form, using the procedure given in Theorem 2.9:**

   $$S \rightarrow XY$$
   $$X \rightarrow abb \mid aXb \mid \varepsilon$$
   $$Y \rightarrow c \mid cY$$

9) Ambiguity: **Consider the following two CFGs:**

   (a) $S \rightarrow Ab \mid A$
   $$A \rightarrow b \mid bA$$
   (b) $S \rightarrow aS \mid Sa \mid b$

   For each of the grammars, demonstrate that it is ambiguous by providing a string that has two or more different leftmost derivations.

What to submit:

1. Type your answers. Use JFLAP software to create and test all the automata from the assignment. Save automata as images and insert into your answers.
2. Submit your answers (including images of automata) as a pdf file.