Complete this checkpoint on your own, and email your solution to okahn & afrank@andrew.cmu.edu by 11:59 PM on February 6th with "[`FLAC checkpoint 1`]" in the subject.

Your work should be legible and preferably typed, but you don't have to use TeX.

1   CFGs

Make context-free grammars for the following languages:

(a) Matched parentheses

(b) $\{w \in \{a, b, c\}^* \mid |w| \equiv 0 \bmod 2 \text{ or } |w| \equiv 0 \bmod 3\}$

(c) $\{a^i b^j c^k \mid i = j \text{ or } j = k\}$

2   Ambiguity

What does it mean for a grammar to be ambiguous?

When might you want to avoid using an ambiguous grammar?

3   CNF

Write the following grammars in Chomsky normal form:

(a) $A \rightarrow BAB \mid B \mid \epsilon$
    $B \rightarrow 00 \mid \epsilon$

(b) $A \rightarrow BB \mid \epsilon$
    $B \rightarrow AA \mid 0 \mid 1$

4   PDA

Draw a push-down automaton for the language $\{0^n 1^{2n} \mid n \in \mathbb{N}\}$.