

Final Examination, CSE477-Ling549, Fall 1999

Please return your examination to Room 555 Moore or to the front desk in IRCS by DEC 13.

Problem 1: 15 points

Convert the following CFG into a Chomsky Binary Normal Form

$$S \rightarrow SaA|SA|b$$

$$A \rightarrow Ad|ASa|aS|c$$

Problem 2: 15 points

Let G be a CFG whose production rules are

$$S \rightarrow SbS$$

$$S \rightarrow a$$

Show that G is an ambiguous grammar. Is $L(G)$, the language of G , ambiguous or unambiguous? Justify your answer.

Problem 3: 20 points

$$\text{Let } L = \{a^i b^j c^{\max(i,j)} \mid i \geq 1, j \geq 1\}$$

Is L a context-free language? If so, give a context-free grammar for L . If not, show that L is not a context-free language.

Problem 4: 20 points

(a) Give a context-free grammar for the language for the language

$$L = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and either } i = j \text{ or } j = k\}$$

(b) Is your grammar for L ambiguous? If yes then give an ambiguous string in the language, otherwise show why the grammar is unambiguous.

(c) Give an informal description of a pushdown automaton that recognizes L .

Problem 5: 30 points

Construct a Lexicalized Tree-Adjoining Grammar (LTAG) and a Categorical grammar (CG) that will be adequate to describe the sentence types listed below. For the LTAG, show the elementary trees and the 'derivation' trees for the sentences listed below. For the CG, show the basic categories, reductions and the derivations. You should only show the critical parts of the derivations.

1. Harry left.
2. Harry left yesterday

3. Mary thinks Harry left yesterday.
4. Bill invited Harry for the party.
5. Who did Bill invite for the party?
6. Who do you think Bill invited for the party?
7. John appears to be happy.
8. John wants to swim.

Please do not write too much. If you show the basic structures and derivations clearly, I will be able to make the right inferences.