

Final Examination, CSE477/Ling477, Fall 1996, December 10, 1996

Please return your examination to my office (Room 555 Moore) or to the CIS receptionist on the same floor by no later than Friday, December 13 (!), 12 noon.

Problem 1: 15 points

Which one of the following are true?

1. $baa \in a^*b^*a^*b^*$

2. $b^*a^* \cap a^*b^* = a^* \cup b^*$

3. $a^*b^* \cap c^*d^* = \phi$

Problem 2: 20 points

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 3: 15 points

Convert the following CFG into a Chomsky Normal Form

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

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

Problem 4: 30 points

Let $L = \{w = |w \in \{a, b\}^*, |w| \text{ is even and } w \text{ is a palindrome} \}$

1. Construct a grammar for L .
2. Construct a PDA for L . You need not construct this PDA according to the Grammar in 1. above. Check that your PDA is correct by taking a couple of strings in L and a couple not in L .
3. State informally how the Grammar in 1. above and the PDA in 2. above would have to be modified if the condition that $|w|$ is even is removed from the definition of L .

Problem 5: 20 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.