

CS 3240 : Languages and Computation
Homework IV
Due Beginning of Class, Thursday, April 9th 2009
Total Points : 100

Guidelines:

1. You can discuss the homework problems at a higher level with other students. However, you must write the homework solutions completely independently and also report the names of the collaborators with whom you discussed the homework. Do not copy solutions from any other source under any circumstance.
2. Answers should be concise, complete and precise
3. Return a hard copy of the homework, the homework is due at the beginning of the class; no late homework submission please.

Questions: Write Context Free Grammars (CFGs) for the following languages

1. $\{w \mid w \text{ consists of any string made out of alphabet } \{0, 1\} \text{ that can contain a } 0 \text{ at the } 4^{\text{th}} \text{ position from the end and/or } 1 \text{ from the } 2^{\text{nd}} \text{ position from the end}\}$
2. The complement of the language $\{a^n b^{2n} \mid n > 0\}$
3. $L = \{a^i b^j c^k, 2i = j \text{ or } i = k\}$
4. $L = \{(a \mid b)^* (ab)^* a^* b^+, \text{ alphabet} = \{a, b\}\}$

Questions : Consider the following grammar :

$S \rightarrow SS \mid + \mid SS^* \mid a$

- 5 For the string $aa + a^*$ give a leftmost derivation and a rightmost derivation
- 6 Give a parse tree and decide if the grammar is ambiguous or unambiguous

Question : Consider the following grammar:

$S \rightarrow aAb \mid bB \mid cA \mid DB$
 $A \rightarrow aBb \mid e \mid DB$
 $B \rightarrow bAa \mid e \mid cSc \mid \epsilon$
 $D \rightarrow d$

7. Find the **First()** and **Follow()** sets for each of the non-terminals, S, A, B and D.
8. Compute the **Predict()** sets for each of the productions.
9. Generate the parsing table for the grammar using the above sets. Is the grammar **LL(1)**?