CSE 322 Autumn 2004

Homework Assignment # 5

Due Date: Friday, November 19 (at the *beginning* of class)

1. (20 points) Consider the CFG G_2 on page 93 in the textbook. For each of the following strings, decide whether or not the string is in L(G_2). Give a parse tree OR a leftmost derivation for the string if it is in L(G_2) (see page 98 for a definition of leftmost derivation):
    a. the boy likes the flower
    b. a flower sees
    c. girl likes boy
    d. the boy with the girl sees the flower with a flower

2. (30 points) Let $\Sigma = \{0,1\}$. Give CFGs that generate the following languages over the set of terminals Σ:
    a. $\{w \mid w$ contains an equal number of 0s and 1s$\}$
    b. $\{w \mid w$ contains more 0s than 1s$\}$
    c. $\{w \mid w$ contains at least two 0s$\}$
    d. $\{w \mid w$ does not contain the substring 101$\}$
    e. $\{0^i10^j10^k \mid i = j \text{ or } j = k\}$
    f. the complement of $\{0^n1^n \mid n \geq 0\}$

3. (20 points) Problems 2.21a and 2.21b on page 122 in the textbook.

4. (30 points) Give informal descriptions (as in Example 2.10 in the textbook) and state diagrams of pushdown automata (PDA) for the following languages over $\Sigma = \{0,1\}$:
    a. $\{w \mid w$ contains twice as many 0s as 1s$\}$
    b. $\{w \mid w = w^R$ i.e., w is a palindrome$\}$
    c. $\{0^i1^j \mid i \leq j \leq 2i\}$

(Just for fun – nothing to turn in!) Test your pushdown automata for some of the above problems by simulating them on the web (this link is also on the 322 lectures website): http://www.cs.duke.edu/~rodger/tools/jflap/applet1.0/demo.html