

# Homework 6

CS 4313 – Spring 2003  
Tom Bylander, Instructor

assigned February 19, 2003  
due date February 26, 2003

1. Provide brief descriptions (20 words or less) of at least *two* of the following regular expressions over the alphabet  $\{a, b\}$ . Each regular expression performs a simple task. Do not simply rewrite the regular expression in English. Points will be divided equally among the problems you attempt.

(a)  $(aa + b)^* + (a + bb)^*$

(b)  $(a + b + \lambda)(a + b + \lambda)(a + b + \lambda)(a + b + \lambda)$

(c)  $b^*(a + bbb^*)^*aba(a + bbb^*)^*b^*$

(d)  $(aa + bb)^*(ab + ba)((aa + bb)^*(ab + ba)(aa + bb)^*(ab + ba))^*(aa + bb)^*$

2. (60 pts.) Consider the following CFG in Chomsky normal form:

$$S \rightarrow CE$$

$$C \rightarrow AD \mid AB$$

$$D \rightarrow CB$$

$$E \rightarrow EE \mid a \mid b$$

$$A \rightarrow a$$

$$B \rightarrow b$$

- (a) Show a derivation tree for  $aabbab$ .
  - (b) Provide a string that is ambiguous, i.e., has at least two derivation trees.
  - (c) Show the values in the  $V$  table of the CYK algorithm for the string  $aabb$ . Note:  $S$  cannot derive this string, so  $S$  will not be a member of  $V[1, 4]$ .
3. Do Exercise 7.1.4d. Hint: While reading  $a$ 's, push  $a$ 's on the stack. While reading  $b$ 's, pop all the  $a$ 's off the stack. While there are any more  $b$ 's to read, push  $b$ 's on the stack. Finally, while reading  $c$ 's, pop  $b$ 's off the stack. Make sure the stack is empty when you are done. Make sure that at least one  $c$  is read.