

CSc 30400 Introduction to Theory of Computer Science 6th Homework Set

1. Consider the following grammar:

$$S \rightarrow AB$$

$$A \rightarrow BB|0$$

$$B \rightarrow AA|1$$

For each of the following strings decide whether the above grammar produces the string or not running the CYK algorithm. If the answer is yes write a derivation.

- a. 10111
 - b. 01001
2. Give Pushdown Automata for the following languages (remember that an NFA_ϵ is by definition a Pushdown Automaton without the stack, so if some of these languages are regular you don't need the additional power that the stack provides. However, if you want, you are free to use additional memory to your automaton). In all parts the alphabet is $\Sigma = \{0, 1\}$.
 - a. $L_1 = \{w \mid w \text{ contains at least three 1s}\}$
 - b. $L_2 = \{0^n 1^{2n} \mid n \geq 0\}$
 - c. $L_3 = \{w \mid w \text{ starts and ends with the same symbol}\}$
 - d. $L_4 = \{w_1 w_2 \mid \text{the lengths of } w_1 \text{ and } w_2 \text{ are equal}\}$
 - e. $L_5 = \{w \mid w = w^R, \text{ that is } w \text{ is palindrome}\}$
 - f. $L_6 = L^*$, where $L = \{0^n 1^n \mid n \geq 0\}$
 3. Show that Context Free Languages are closed under concatenation by using PDAs.

Hint: Given two PDAs M_1 and M_2 that recognize the Context Free Languages L_1 and L_2 construct a PDA M that recognizes $L = L_1 \circ L_2$