

CS 321 HW 5 – 25 points

1. (5 pts) Convert the grammar below to CNF.

$G = (V, T, S, P)$ where
 $V = \{ S, A, B, C, D \}$
 $T = \{ 0, 1, 2 \}$
and P is given below.

$S \rightarrow A \mid ABD \mid 0BB$
 $A \rightarrow 0 \mid BAA$
 $B \rightarrow BB \mid 1 \mid 2 \mid \lambda$
 $C \rightarrow CD \mid 0$
 $D \rightarrow D1 \mid DD$

2. (5 pts) Consider the CNF grammar $G = (V, T, S, P)$ where
 $V = \{ S, A, B, C, D \}$, $T = \{ a, b, c \}$, $S = S$ and P is given below.

$S \rightarrow AB \mid AD \mid AC$
 $A \rightarrow AA \mid a$
 $B \rightarrow BB \mid AB \mid b$
 $C \rightarrow AC \mid DC \mid c$
 $D \rightarrow DD \mid b \mid c$

Use the CYK algorithm to determine if the strings $w_1 = babbc$ and $w_2 = aaaabb$ are in the language $L(G)$. Show the DP table. If the string is in $L(G)$ construct the parse tree.

3. (15 pts) Construct npda's that accept the following languages on $\Sigma = \{a, b, c\}$. Give both a verbal explanation on how your npda works and the formal definition including the transition function and/or transition graph. **You must use JFLAP**. Submit the transition graph in the HW pdf and the JFLAP code file for each problem.

a) $L = \{ a^n b^{2n} : n \geq 0 \}$

b) $L = \{ w : n_a(w) = 2n_b(w) \}$

c) $L = \{ wcw^R : w \in \{a, b\}^* \}$