EX 6.8

$S \to ABa,$ $A \to aab,$ $B \to Ac$ $\Rightarrow$ CNF

$V_a \to a, V_b \to b, V_c \to c$
$S \to ABV_a,$
$A \to V_aV_aV_b,$
$B \to AV_c$

$\Rightarrow$

$V_a \to a, V_b \to b, V_c \to c,$
$S \to AD_1, D_1 \to BV_a,$
$A \to V_aD_2, D_2 \to V_aV_b$
$B \to AV_c.$ ∎

EX 6.2 Q1

$S \to aSS|a|b \Rightarrow$ CNF.

$V_a \to a,$
$S \to V_aSS|a|b$ $\Rightarrow$ $V_a \to a,$
$S \to V_aD_1, D_1 \to SS,$
$S \to a|b.$

EX 6.2 Q2.

$S \to aSb|Sab|ab \Rightarrow$ CNF

$V_a \to a, V_b \to b.$
$S \to V_a\underbrace{SV_b}_{D_1} | S\underbrace{V_aV_b}_{D_2} | V_aV_b.$

EX 6.10

$S \to abSb|aa$
$\Rightarrow$ GNF
$V_a \to a, V_b \to b,$
$S \to aV_bSV_b | aV_a.$

EX 6.2 Q10.

$S \to aSb|bSa|a|b|ab$
$\Rightarrow$ GNF
$V_a \to a, V_b \to b,$
$S \to aSV_b | bSV_a | a | b | aV_b$

CYK EX.

$S \to AB|BC$
$A \to BA|a$
$B \to CC|b,$
$C \to AB|a.$

$W = baaba \in L(G)$?

∅				
S,A	B	S,C	S,A	
B	A,C	A,C	B	A,C

$B \times (A,C) = BA, BC$
$(A,C) \times (A,C) = AA, AC, CA, CC.$
baa aab aba
ba aa ab ba
b a a b a.
$(A,C) \times B = AB, CB$
AB CB

baa → b×aa, ba×a.
B, ∅

$(S,A) \times (A,C) = SA, SC, AA, AC, \emptyset$

aab → a×ab aa×b

쭉 쭉 한다 ∎

EX 7.4

NPDA for $L = \{n_a(w) = n_b(w)\}$

sol. a 들어오면 0 넣고, b 들어오면 1 넣고.

$\delta(q_0, \lambda, Z) = \{(q_f, Z)\}$
$\delta(q_0, a, Z) = \{(q_0, 0Z)\}.$ $\delta(q_0, b, Z) = \{(q_0, 1Z)\}.$
$\delta(q_0, a, 0) = \{(q_0, 00)\}.$ $\delta(q_0, b, 1) = \{(q_0, 11)\}.$
$\delta(q_0, a, 1) = \{(q_0, \lambda)\}.$ $\delta(q_0, b, 0) = \{(q_0, \lambda)\}$ ∎

Let's Parse $w = baab.$

$(q_0, baab, Z) \vdash (q_0, aab, 1Z)$
$\vdash (q_0, ab, Z)$
$\vdash (q_0, b, 0Z)$
$\vdash (q_0, \lambda, Z)$
$\vdash (q_f, \lambda, Z)$ ∎.

EX7.5

NPDA for $L=\{wcw^R\}$ abb bba

$\delta(q_0,\lambda,z)=\{(q_0,z)\}$

$\delta(q_0,a,z)=\{(q_0,az)\}$ $\delta(q_0,b,z)=\{(q_0,bz)\}$

$\delta(q_0,a,a)=\delta(q_0,a,b)=\{(q_0,ab)\}$

$\{(q_0,aa)\}$

$\delta(q_0,b,a)=\{(q_0,ba)\}$ $\delta(q_0,b,b)=\{(q_0,bb)\}$

$\delta(q_0,\lambda,a)=\{(q_1,\lambda a)\}$ $\delta(q_0,\lambda,b)=\{(q_1,b)\}$

pop

EX7.6

$S\to aSbbla \Rightarrow$ PDA

Sol ① GNF

$V_b\to b$,

$S\to aSV_bV_bla$.

② GNF → PDA

$\delta(q_0,\lambda,z)=\{(q_1,Sz)\}$

$\delta(q_1,a,S)=\{(q_1,SV_bV_b),(q_1,\lambda)\}$

$\delta(q_1,b,V_b)=\{(q_1,\lambda)\}$

$\delta(q_1,\lambda,z)=\{(q_f,z)\}$

EX7.7

$S\to aA$

$A\to aABC|bB|a \Rightarrow$ PDA

$B\to b$

$C\to c$

$\delta(q_0,\lambda,z)=\{(q_1,Sz)\}$

$\delta(q_1,a,S)=\{(q_1,A)\}$

$\delta(q_1,a,A)=\{(q_1,ABC),(q_1,\lambda)\}$

⋮

X기출

$L=\{a^nb^n : n\geq 0\}$ → PDA?

$\delta(q_0,a,z)=\{(q_0,az)\}$

$\delta(q_0,a,a)=\{(q_0,aa)\}$

$\delta(q_0,\lambda,z)=\{(q_1,z)\}$ $\delta(q_0,\lambda,a)=\{(q_1,a)\}$

$\delta(q_1,b,a)=\{(q_1,\lambda)\}$

$\delta(q_1,\lambda,z)=\{(q_f,z)\}$

EX8.1

$L=\{a^n b^n c^n : n \geq 0\}$ is not CFL 증명.

[O] 증명할 pal 대해 $w = a^m b^m c^m$ 라 하자. $(w \in L, |w| \geq m)$

[X] $w = uvxyz$ 에 대해 $vxy = b^k$ 꼴을 만족 $(|vxy| \leq m, |vy| \geq 1)$

aa cc bb bb cc cc

vxy

EX8.2 $W_2 \rightarrow$ 안됨

EX8.3

$L=\{a^{n!} : n \geq 0\}$ is not CFL 증명.

증명할 pal 대해 $w = a^{m!}$. $(w \in L, |w| \geq m)$

EX9.7

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

▷	a	a	a	b	b	b	b	□

$\delta(q_0, a) = (q_1, x, R)$ $\delta(q_1, a) = (q_1, a, R)$

$\delta(q_1, b) = (q_2, y, L)$ $\delta(q_2, a) = (q_2, a, L)$

$\delta(q_2, x) = (q_0, x, R)$

$\delta(q_1, y) = (q_1, y, R)$ $\delta(q_2, y) = (q_2, y, L)$

$\delta(q_0, y) = (q_3, y, R)$

$\delta(q_3, y) = (q_3, y, R)$ $\delta(q_3, \square) = (q_5, \square, L)$

$q_0(aa\cdots a)(bb\cdots b) \vdash^* x q_0 (a\cdots a) y (b\cdots b)$

EX9.9

▷	1	1	1	0	1	1	□

$\delta(q_0, 1) = (q_0, 1, R)$

$\delta(q_0, 0) = (q_1, 1, R)$

$\delta(q_1, 1) = (q_1, 1, R)$

$\delta(q_1, 0) = (q_2, \square, L)$

$\delta(q_2, 1) = (q_5, 0, R)$

$q_0 w(x) 0 w(y) \vdash^* q_5 w(x+y) 0$

EX9.10

$q_0 w \vdash^* q_5 www$. TM?

$\Sigma = \{1\}^+$

▷	x	x	x	a
0	1	1	1	1

$\delta(q_0, 1) = (q_0, x, R)$

$\delta(q_0, \square) = (q_1, \square, L)$

$\delta(q_1, x) = (q_2, 1, R)$, $\delta(q_1, 1) = (q_1, 1, L)$

$\delta(q_2, \square) = (q_1, 1, L)$, $\delta(q_3, 1) = (q_2, 1, R)$

$\delta(q_1, \square) = (q_5, \square, R)$

EX9.11

$x \geq y$ AC. $x < y$ reject

▷	1	1	1	0	1	1	□

$x \geq y$. $q_0 w(x) 0 w(y) \vdash^* q_5 w(x) 0 w(y)$