

Sample Assignment # 6.1 Key

1. Write a CFG for the following languages:

$L = \{ a^p b^q c^r \mid p = |q - r| \}$ where $|x|$ is absolute value of x

$L = \{ a^p b^q c^r \mid q = p + r \text{ or } r = p + q \}$

$S \rightarrow AB \mid C$

$A \rightarrow aAb \mid \lambda$

$B \rightarrow bBc \mid \lambda$

$C \rightarrow aCc \mid B$

Sample Assignment # 6.2a Key

2. Convert the following grammar to a CNF equivalent grammar. Show all steps.

$G = (\{S, B, L, P, E\}, \{i, t, s, e, \{, \}, :, 0, 1\}, R, S)$, where R is

1. $G = (\{S, A, B\}, \{a, b\}, S, R)$ where R is:

$S \rightarrow SS \mid ABA$

$A \rightarrow ABB \mid a$

$B \rightarrow BS \mid b \mid \lambda$

Remove lambda rules

Nullables = $\{ B \}$

$S \rightarrow SS \mid ABA \mid AA$

$A \rightarrow ABB \mid AB \mid a$

$B \rightarrow BS \mid S \mid b$

Sample Assignment # 6.2b Key

Remove Unit Rules

$S \rightarrow SS \mid ABA \mid AA$

$A \rightarrow ABB \mid AB \mid a$

$B \rightarrow BS \mid S \mid b$

Remove Chain (Unit) Rules

$\text{Chain}(S) = \{ S \}; \text{Chain } A = \{ A \}; \text{Chain } (B) = \{ B, S \};$

$S \rightarrow SS \mid ABA \mid AA$

$A \rightarrow ABB \mid AB \mid a$

$B \rightarrow BS \mid SS \mid ABA \mid AA \mid b$

Productive = $\{S, A, B\}$

NO CHANGE

Remove Unreachable Symbols

Reachable = $\{S, A, B\}$

NO CHANGE

Sample Assignment # 6.2c Key

Convert to CNF

$S \rightarrow SS \mid ABA \mid AA$

$A \rightarrow ABB \mid AB \mid a$

$B \rightarrow BS \mid SS \mid ABA \mid AA \mid b$

$S \rightarrow SS \mid \langle AB \rangle A \mid AA$

$A \rightarrow \langle AB \rangle B \mid AB \mid a$

$B \rightarrow BS \mid SS \mid \langle AB \rangle A \mid AA \mid b$

$\langle AB \rangle \rightarrow AB$

Sample Assignment # 6.3

	a	-	(b	-	a)	+	a
1	EF	M	L	EF	M	EF	Q	P	EF
2					H	K		G	
3				E					
4				K					
5			EF						
6		H							
7	E		E						
8									
9	E								

E → EG | EH | LK | a | b
 G → PF
 H → MF
 K → EQ
 F → a | b | LK
 P → +
 M → -
 L → (
 Q →)