CNC 2012
Formal Languages
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Assignment 7
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1.) $S \to aS \mid bS \mid B$
$B \to bb \mid c \mid \lambda$
$C \to cC \mid \lambda$

$(a|b)^*c^*$

nullables : $\{C, B, S\}$

$S \to S' \mid \lambda$
$S' \to a \mid b \mid aS \mid bS \mid B$
$B \to bb \mid C$
$C \to cC \mid c$

7.) $S \to AS \mid A$
$A \to aA \mid bB \mid C$
$B \to bB \mid b$
$C \to cC \mid B$

chainable (S) : $\{S, A, C, B\}$
(A) : $\{A, C, B\}$
(B) : $\{B\}$
(C) : $\{C, B\}$

$S \to AS \mid aA \mid bB \mid cC \mid bB \mid b$
$A \to aA \mid cC \mid bB \mid b$
$B \to bB \mid b$
$C \to cC \mid bB \mid b$

$(a^+b^+ \mid a^+c^+b^+ \mid b^+ \mid c^+b^+)^+$

14.) $S \to AA \mid CD \mid bB$
$A \to aA \mid a$
$B \to bB \mid bC$
$C \to cB$
$D \to dD \mid d$

Term $\{A,D\} \cup \{S\} \cup \{\} \Rightarrow \{A,D,S\}$
Prev $\{A,D\} \cup \{S\}$

$S \to AA$
$A \to aA \mid a$
$D \to dD \mid d$

Reach $\{S\} \cup \{A\} \Rightarrow \{S,A\}$
Prev $\{\} \quad \{S\} \quad \{\}$

$S \to AA$
$A \to aA \mid a$

23.)
$S \to A \mid ABa \mid AbA$
$A \to Aa \mid \lambda$
$B \to Bb \mid BC$
$C \to CB \mid CA \mid bB$

nullables: $\{A,S\}$

$S \to \lambda \mid A \mid ABa \mid AbA \mid Ba \mid Ab \mid bA \mid b$
$A \to Aa \mid a$
$B \to Bb \mid BC$
$C \to CB \mid CA \mid bB$

chains (S): $\{S,A\}$
(A): $\{A\}$
(B): $\{B\}$
(C): $\{C\}$

$S \to \lambda \mid Aa \mid a \mid ABa \mid AbA \mid Ba \mid Ab \mid bA \mid b$
A, B, C: No change

Term $\{S,A\}$
Reach $\{S,A\}$

$S \to \lambda \mid Aa \mid a \mid AbA \mid Ab \mid bA \mid b$
$A \to Aa \mid a$

$S \to \lambda \mid AA' \mid a \mid AT \mid AB' \mid B'A \mid b$
$A' \to a$
$B' \to b$
$A \to AA' \mid a$
$T \to B'A$

26.) $S \to AX \mid AY \mid a$

$X \to AX \mid a$

$Y \to BY \mid a$

$A \to a$

$B \to b$

a, b a, a a

	1	2	3	4	5
1	S,X,Y,A	∅	∅	S	∅
2		B	∅	Y	Y
3			S,X,Y,A	S,X	S,X
4				S,X,Y,A	S,X
5					S,X,Y,A

nope

b a a a

	1	2	3	4
1	B	Y	∅	∅
2		S,X,Y,A	S,X	S,X
3			S,X,Y,A	S,X
4				S,X,Y,A

nope

32.) order: $S \to A \to B \to C$

$S \to AB \mid BC$

$A \to AB \mid a$

$B \to AA \mid CB \mid b$

$C \to a \mid b$

$\Rightarrow$

$A \to a \mid aR_1$

$R_1 \to B \mid BR_1$

$B \to aA \mid aR_1A \mid CB \mid b$

$S \to aB \mid aR_1B \mid aAC \mid aR_1AC \mid CBC \mid bC$

$S \to aB \mid aR_1B \mid aAC \mid aR_1AC \mid aBC \mid bBC \mid bC$

$A \to a \mid aR_1$

$B \to aA \mid aR_1A \mid aB \mid bB \mid b$

$R_1 \to aA \mid aR_1A \mid aB \mid bB \mid b \mid aAR_1 \mid aR_1AR_1 \mid aBR_1 \mid bBR_1 \mid bR_1$