

TOA

CNF (continued)

Q //

$$S \rightarrow \{ S \} \mid \wedge$$

① New starting variable

$$S_0 \rightarrow S$$

$$S \rightarrow \{ S \} \mid \wedge$$

② Remove null transition

$$S \rightarrow \{ \} , S_0 \rightarrow \wedge$$

now

$$S_0 \rightarrow S \mid \wedge$$

$$S \rightarrow \{ S \} \mid \{ \}$$

③ Remove unit production

$$S_0 \rightarrow \{ S \} \mid \{ \} \mid \wedge$$

$$S \rightarrow \{ S \} \mid \{ \}$$

finally + discard that rules which can't be reached directly or indirectly from starting variable.

(4) implement $\left\{ \begin{array}{l} A \rightarrow AB \\ A \rightarrow a. \end{array} \right\}$

ex

let

$$X = \{ \quad \quad \quad \} \quad Y = \{ \quad \quad \quad \}$$

$$S_0 \rightarrow XSY \mid XY \mid \Lambda$$

$$S \rightarrow XSY \mid XY$$

(5)

$$S_0 \rightarrow XW \mid XY \mid \Lambda$$

$$W \rightarrow SY$$

$$S \rightarrow XW \mid XY$$

$$X \rightarrow \{ \quad \quad \}$$

$$Y \rightarrow \{ \quad \quad \}$$

Q1

$$S \rightarrow ABAC$$

$$A \rightarrow aA \mid \wedge$$

$$B \rightarrow bB \mid \wedge$$

$$C \rightarrow cC \mid c$$

Ans

① $S_0 \rightarrow S$

② $A \rightarrow \wedge, B \rightarrow \wedge$

① remove $A \rightarrow \wedge$

$$S_0 \rightarrow S$$

$$S \rightarrow BAC \mid ABC \mid BC \mid ABAC$$

$$A \rightarrow aA \mid a$$

$$B \rightarrow bB \mid \wedge$$

$$C \rightarrow cC \mid c$$

② remove $B \rightarrow \wedge$

$$S \rightarrow AAC \mid AC \mid cC$$

$$B \rightarrow b$$

$$S_0 \rightarrow S$$

$$S \rightarrow ABAC \mid BAC \mid ABC \mid BC \mid AAC \mid AC \mid C$$

$$A \rightarrow aA \mid a$$

$$B \rightarrow bB \mid b$$

$$C \rightarrow cC \mid c$$

(3) Remove unit production :-

$$S_0 \rightarrow ABAC \mid BAC \mid ABC \mid BC \mid AAC \mid AC \mid cC \mid c$$

X

$$S \rightarrow ABAC \mid BAC \mid ABC \mid BC \mid AAC \mid AC \mid cC \mid c$$

$$A \rightarrow aA \mid a$$

$$B \rightarrow bB \mid b$$

$$C \rightarrow cC \mid c$$

↓
S, it can't be reached from starting variable S_0

(4)

$$\begin{array}{l} X \rightarrow a \\ Y \rightarrow b \\ Z \rightarrow c \end{array}$$

$$S_0 \rightarrow AW \mid BU \mid AV \mid AU \mid AC \mid ZC \mid c$$

$$W \rightarrow BU$$

$$U \rightarrow AC$$

$$V \rightarrow BC$$

$$A \rightarrow XA \mid a$$

$$B \rightarrow YB \mid b$$

$$C \rightarrow ZC \mid c$$

$$X \rightarrow a$$

$$Y \rightarrow b$$

$$Z \rightarrow c$$

CYK

$\overset{1}{\xi} \overset{2}{\xi} \overset{3}{\zeta} \overset{4}{\zeta} \Rightarrow$ given string

length of string is 4 so we make a 4×4 table

	4	3	2	1
1	S_0, S	\emptyset	\emptyset	X
2	W	S_0, S	X	/
3	\emptyset	Y	/	/
4	Y	/	/	/

\rightarrow if starting variable (S_0) is present in first block $(1, 4)$ then given string is accepted.

$(1, 1) \rightarrow \xi$
~~X~~ $\rightarrow \xi$

$(2, 2) \rightarrow \xi$
 $X \rightarrow \xi$

$(3, 3) \rightarrow \zeta$
 $Y \rightarrow \zeta$

$(4, 4) \rightarrow \zeta$
 $Y \rightarrow \zeta$

$(1, 2) \rightarrow (1, 1) (2, 2)$
 $(1, 2) \rightarrow X X$
 $\emptyset \rightarrow XX$

$(2, 3) \rightarrow (2, 2) (3, 3)$
 $(2, 3) \rightarrow X Y$
 $S_0 \rightarrow XY$
 and
 $S \rightarrow XY$

$(3, 4) \rightarrow (3, 3) (4, 4)$
 $(3, 4) \rightarrow Y Y$
 $\emptyset \rightarrow YY$

$$(1, 3) \rightarrow \begin{matrix} X \\ U \end{matrix} (1, 1) \quad \begin{matrix} S_0, S \\ (2, 3) \Rightarrow X(S_0, S) \\ X S_0 / X S \end{matrix}$$

$$(1, 3) \rightarrow \begin{matrix} \emptyset \\ \phi \end{matrix} (1, 2) \quad \begin{matrix} Y \\ (3, 3) \end{matrix} = \emptyset$$

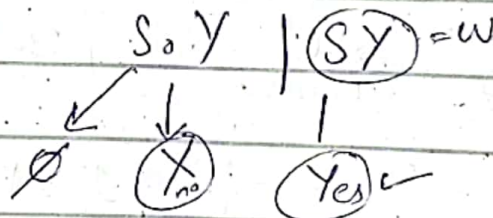
$$= \phi$$

$$(2, 4) \rightarrow \begin{matrix} X \\ U \end{matrix} (2, 2) \quad \begin{matrix} \emptyset \\ (3, 4) \end{matrix}$$

$$= \emptyset$$

$$(2, 4) \rightarrow (2, 3) \quad (4, 4)$$

$$(S_0, S) \cdot Y$$



$$(1, 4) \rightarrow \begin{matrix} X \\ U \end{matrix} (1, 1) \quad \begin{matrix} W \\ (2, 4) \end{matrix}$$

$$= S_0, S$$

$$(1, 4) \rightarrow \begin{matrix} \emptyset \\ U \end{matrix} (1, 3) \quad (4, 4)$$

$$(1, 4) \rightarrow \begin{matrix} \emptyset \\ \phi \end{matrix} (1, 2) \quad (3, 4)$$