GRAMÁTICA

<C> ::= <R> ⊣

<R> ::= <NT> '::=' <P> ';' <R>
| <NT> '::=' <P>

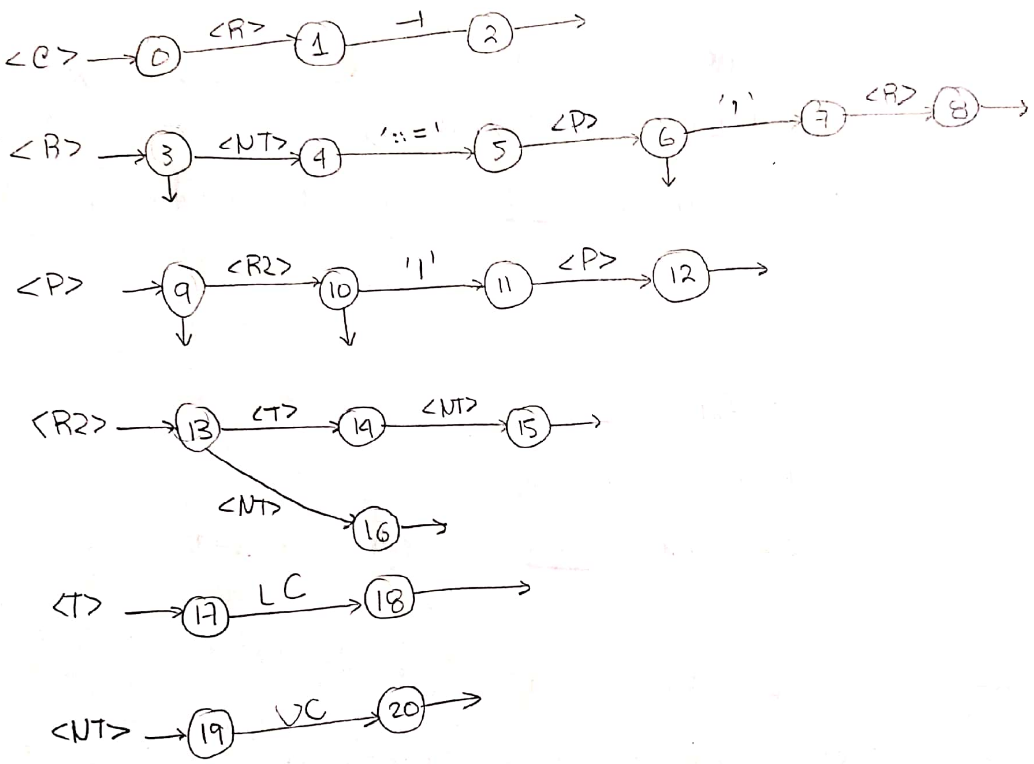
| ε

<P> ::= <R2> '|' <P>
| <R2>
| ε

<R2> ::= <T><NT>
| <NT>

<T> ::= LC

<NT> ::= UC



$I_0 = closure_1(\langle 0, ⊣\rangle)$

$C = \langle 0, ⊣\rangle$

$C = \langle 0, ⊣\rangle \cup \langle 3, ⊣\rangle$

$C = \langle 0, ⊣\rangle \cup \langle 3, ⊣\rangle \cup \langle 19, \text{'::='}\rangle = I_0$

$R_0 = \{I_0\}$

Conjunto de evaluación

$\Sigma \cup V \cup \{⊣\} = \{\text{'::='}, \text{';'}, \text{'|'}, LC, UC\} \cup$
$\{\langle R\rangle, \langle P\rangle, \langle R2\rangle, \langle T\rangle, \langle NT\rangle\} \cup$
$\{⊣\}$

- $x = UC$

$$\theta(I_0, UC) = closure_1(\langle \delta(0,UC), \dashv\rangle) \cup closure_1(\langle \cancel{\delta(3,UC), \dashv}\rangle) \cup closure_1(\langle \delta(19,UC), \text{'::='}\rangle)$$

$$\mid C = \langle 20, \text{'::='}\rangle = \underline{I_1}$$

$$R_1 = R_0 \cup \{I_1\}$$

- $x = \langle R\rangle$

$$\theta(I_0, \langle R\rangle) = closure_1(\langle \delta(0,\langle R\rangle), \dashv\rangle) \cup closure_1(\langle \cancel{\delta(3,\langle R\rangle), \dashv}\rangle) \cup closure_1(\langle \cancel{\delta(19,\langle R\rangle)}, \text{'::='}\rangle)$$

$$\mid C = \langle 1, \dashv\rangle = \underline{I_2} \qquad R_2 = R_1 \cup \{I_2\}$$

- $x = \langle NT\rangle$

$$\theta(I_0, \langle NT\rangle) = closure_1(\langle \cancel{\delta(0,\langle NT\rangle), \dashv}\rangle) \cup closure_1(\langle \delta(3,\langle NT\rangle), \dashv\rangle) \cup closure_1(\langle \cancel{\delta(19,\langle NT\rangle), \text{'::='}}\rangle)$$

$$\mid C = \langle 4, \dashv\rangle = \underline{I_3} \qquad R_3 = R_2 \cup \{I_3\}$$

- $x = \Sigma \cup V \cup \{\dashv\}$

$$\theta(I_1, x) = \phi$$

$x = \dashv$

$$\theta(I_2, \dashv) = closure_1(\langle \delta(1,\dashv), \dashv\rangle)$$

$$\mid C = \langle 2, \dashv\rangle = \underline{I_4} \qquad R_4 = R_3 \cup \{I_4\}$$

- $x = \text{'::='}$

$$\theta(I_3, \text{'::='}) = closure_1(\langle \delta(4, ::=), \dashv\rangle)$$

$$\mid C = \langle 5, \dashv\rangle \cup \langle 9, \text{'|'}, \dashv\rangle \cup \langle 13, \text{'|'}, \text{'|'}, \dashv\rangle \cup \langle 17, UC\rangle \cup \langle 19, \text{'|'}, \text{'|'}, \dashv\rangle = \underline{I_5} \qquad R_5 = R_4 \cup \{I_5\}$$

- $x = \Sigma \cup V \cup \{\dashv\}$

$$\theta(I_4, x) = \phi$$

$x = \langle P\rangle$

$$\theta(I_5, \langle P\rangle) = closure_1(\langle \delta(5,\langle P\rangle), \dashv\rangle) \cup closure_1(\langle \cancel{\delta(9,\langle P\rangle)}, \text{'|'}, \dashv\rangle) \cup closure_1(\langle \cancel{\delta(13,\langle P\rangle)}, \text{'|'}, \text{'|'}, \dashv\rangle) \cup closure_1(\langle \cancel{\delta(17,\langle P\rangle), UC}\rangle) \cup closure_1(\langle \cancel{\delta(19,\langle P\rangle)}, \text{'|'}, \text{'|'}, \dashv\rangle)$$

$$\mid C = \langle 6, \dashv\rangle = \underline{I_6} \qquad R_6 = R_5 \cup \{I_6\}$$

- $x = \langle R2 \rangle$

$$\vartheta(I_5, \langle R2\rangle) = closure_1(\langle \cancel{\delta(5,\langle R2\rangle)}^{\phi}, \dashv\rangle) \cup closure_1(\langle \delta(9,\langle R2\rangle), ';', \dashv\rangle) \cup$$
$$closure_1(\langle \cancel{\delta(13,\langle R2\rangle)}^{\phi}, '|', ';', \dashv\rangle) \cup$$
$$closure_1(\langle \cancel{\delta(17,\langle R2\rangle)}^{\phi}, UC\rangle) \cup closure_1(\langle \cancel{\delta(19,\langle R2\rangle)}^{\phi}, '|', ';', \dashv\rangle)$$

$$\Big| C = \langle 10, ';', \dashv\rangle = \underline{I_7} \qquad R_7 = R_6 \cup \{I_7\}$$

- $x = \langle T \rangle$

$$\vartheta(I_5, \langle T\rangle) = closure_1(\langle \cancel{\delta(5,\langle T\rangle)}^{\phi}, \dashv\rangle) \cup closure_1(\langle \cancel{\delta(9,\langle T\rangle)}^{\phi}, ';', \dashv\rangle) \cup$$
$$closure_1(\langle \delta(13,\langle T\rangle), '|', ';', \dashv\rangle) \cup$$
$$closure_1(\langle \cancel{\delta(17,\langle T\rangle)}^{\phi}, UC\rangle) \cup closure_1(\langle \cancel{\delta(19,\langle T\rangle)}^{\phi}, '|', ';', \dashv\rangle)$$

$$\Big| C = \langle 14, '|', ';', \dashv\rangle \cup \langle 19, '|', ';', \dashv\rangle = \underline{I_8}$$

$$R_8 = R_7 \cup \{I_8\}$$

- $x = LC$

$$\vartheta(I_5, LC) = closure_1(\langle \cancel{\delta(5,LC)}^{\phi}, \dashv\rangle) \cup closure_1(\langle \cancel{\delta(9,LC)}^{\phi}, ';', \dashv\rangle) \cup$$
$$closure_1(\langle \cancel{\delta(13,LC)}^{\phi}, '|', ';', \dashv\rangle) \cup$$
$$closure_1(\langle \delta(17,LC), UC\rangle) \cup closure_1(\langle \cancel{\delta(19,LC)}^{\phi}, '|', ';', \dashv\rangle)$$

$$\Big| C = \langle 18, UC\rangle = \underline{I_9} \qquad R_9 = R_8 \cup \{I_9\}$$

- $x = UC$

$$\vartheta(I_5, UC) = closure(\langle \cancel{\delta(5,UC)}^{\phi}, \dashv\rangle) \cup closure(\langle \cancel{\delta(9,UC)}^{\phi}, ';', \dashv\rangle) \cup$$
$$closure(\langle \cancel{\delta(13,UC)}^{\phi}, '|', ';', \dashv\rangle) \cup closure(\langle \cancel{\delta(17,UC)}^{\phi}, UC\rangle) \cup$$
$$closure(\langle \delta(19,UC), '|', ';', \dashv\rangle)$$

$$\Big| C = \langle 20, '|', ';', \dashv\rangle = \underline{I_{10}} \qquad R_{10} = R_9 \cup \{I_{10}\}$$

- $x = ';'$

$$\vartheta(I_6, ';') = closure_1(\langle \delta(6, ';'), \dashv\rangle)$$

$$C = \langle 7, \dashv\rangle \cup \langle 3, \dashv\rangle \cup \langle 19, '::=' \rangle = \underline{I_{11}}$$

$$R_{11} = R_{10} \cup \{I_{11}\}$$

- $x = '|'$

$$\vartheta(I_7, '|') = closure(\langle \delta(10, '|'), ';', \dashv\rangle)$$

$$C = \langle 11, ';', \dashv\rangle \cup \langle 9, ';', \dashv\rangle \cup \langle 13, '|', ';', \dashv\rangle \cup \langle 17, UC\rangle \cup$$
$$\langle 19, '|', ';', \dashv\rangle = \underline{I_{12}} \qquad R_{12} = R_{11} \cup \{I_{12}\}$$

- $X = \langle NT \rangle$

$\sigma(I_8, \langle NT \rangle) = closure(\langle \delta(14, \langle NT \rangle), '|', ';', \dashv \rangle) \cup$
$closure(\langle \delta(19, \langle NT \rangle), '|', ';', \dashv \rangle)$

$C = \langle 15, '|', ';', \dashv \rangle = I_{13}$

$R_{13} = R_{12} \cup \{I_{13}\}$

- $X = UC$

$\sigma(I_8, UC) = closure(\langle \cancel{\delta(14, UC)} \to \emptyset, '|', ';', \dashv \rangle) \cup$
$closure(\langle \delta(19, UC), '|', ';', \dashv \rangle)$

$C = \langle 20, '|', ';', \dashv \rangle = I_{10}$

- $X = \Sigma \cup V \cup \{\dashv\}$

$\sigma(I_9, X) = \emptyset$

- $X = \Sigma \cup V \cup \{\dashv\}$

$\sigma(I_{10}, X) = \emptyset$

- $X = \langle R \rangle$

$\sigma(I_{11}, \langle R \rangle) = closure(\langle \delta(7, \langle R \rangle), \dashv \rangle) \cup closure(\langle \cancel{\delta(3, \langle R \rangle)} \to \emptyset, \dashv \rangle) \cup$
$closure(\langle \cancel{\delta(19, \langle R \rangle)} \to \emptyset, ::= \rangle)$

$C = \langle 8, \dashv \rangle = I_{14}$ $\quad R_{14} = R_{13} \cup \{I_{14}\}$

- $X = \langle NT \rangle$

$\sigma(I_{11}, \langle NT \rangle) = closure(\langle \cancel{\delta(7, \langle NT \rangle)} \to \emptyset, \dashv \rangle) \cup closure(\langle \delta(3, \langle NT \rangle), \dashv \rangle) \cup$
$closure(\langle \cancel{\delta(19, \langle NT \rangle)} \to \emptyset, '::=' \rangle)$

$C = \langle 4, \dashv \rangle = I_3$

- $X = UC$

$\sigma(I_{11}, UC) = closure(\langle \cancel{\delta(7, UC)} \to \emptyset, \dashv \rangle) \cup closure(\langle \cancel{\delta(3, UC)} \to \emptyset, \dashv \rangle \cup$
$closure(\langle \delta(19, UC), '::=' \rangle)$

$C = \langle 20, '::=' \rangle = I_1$

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- $x = \langle P \rangle$

$\sigma(I_{12}, \langle P \rangle) = closure(\langle \delta(11, \langle P \rangle), ')', \dashv \rangle) \cup closure(\langle \cancel{\delta(9, \langle P \rangle)}^{\phi}, ')', \dashv \rangle) \cup$
$closure(\langle \cancel{\delta(13, \langle P \rangle)}^{\phi}, '|', ')', \dashv \rangle) \cup closure(\langle \cancel{\delta(17, \langle P \rangle)}^{\phi}, UC \rangle) \cup$
$closure(\langle \cancel{\delta(19, \langle P \rangle)}^{\phi}, '|', ')', \dashv \rangle)$

$| \; C = \langle 12, ')', \dashv \rangle = \underline{I_{15}}$ $\quad R_{15} = R_{14} \cup \{I_{15}\}$

- $x = \langle R2 \rangle$

$\sigma(I_{12}, \langle R2 \rangle) = closure(\langle \cancel{\delta(11, \langle R2 \rangle)}^{\phi}, ')', \dashv \rangle) \cup closure(\langle \delta(9, \langle R2 \rangle), ')', \dashv \rangle) \cup$
$closure(\langle \cancel{\delta(13, \langle R2 \rangle)}^{\phi}, '|', ')', \dashv \rangle) \cup closure(\langle \cancel{\delta(17, \langle R2 \rangle)}, UC \rangle) \cup$
$closure(\langle \cancel{\delta(19, \langle R2 \rangle)}^{\phi}, '|', ')', \dashv \rangle)$

$| \; C = \langle 10, ')', \dashv \rangle = I_7$

- $x = \langle T \rangle$

$\sigma(I_{12}, \langle T \rangle) = closure(\langle \cancel{\delta(11, \langle T \rangle)}^{\phi}, ')', \dashv \rangle) \cup closure(\langle \cancel{\delta(9, \langle T \rangle)}^{\phi}, ')', \dashv \rangle) \cup$
$closure(\langle \delta(13, \langle T \rangle), '|', ')', \dashv \rangle) \cup closure(\langle \cancel{\delta(17, \langle T \rangle)}^{\phi}, UC \rangle) \cup$
$closure(\langle \cancel{\delta(19, \langle T \rangle)}^{\phi}, '|', ')', \dashv \rangle)$

$| \; C = \langle 14, '|', ')', \dashv \rangle \cup \langle 19, '|', ')', \dashv \rangle = I_8$

- $x = \langle NT \rangle$

$\sigma(I_5, \langle NT \rangle) = closure(\langle \cancel{\delta(5, \langle NT \rangle)}^{\phi}, \dashv \rangle) \cup closure(\langle \cancel{\delta(9, \langle NT \rangle)}^{\phi}, ')', \dashv \rangle) \cup$
$closure(\langle \delta(13, \langle NT \rangle), '|', ')', \dashv \rangle \cup$
$closure(\langle \cancel{\delta(17, \langle NT \rangle)}^{\phi}, UC \rangle) \cup closure(\langle \cancel{\delta(19, \langle NT \rangle)}^{\phi}, '|', ')', \dashv \rangle)$

$| \; C = \langle 16, '|', ')', \dashv \rangle = \underline{I_{16}}$ $\quad R_{16} = R_{15} \cup \{I_{16}\}$

- $x = \langle NT \rangle$

$\sigma(I_{12}, \langle NT \rangle) = closure(\langle \cancel{\delta(11, \langle NT \rangle)}^{\phi}, ')', \dashv \rangle) \cup closure(\langle \cancel{\delta(9, \langle NT \rangle)}^{\phi}, ')', \dashv \rangle) \cup$
$closure(\langle \delta(13, \langle NT \rangle), '|', ')', \dashv \rangle \cup$
$closure(\langle \cancel{\delta(17, \langle NT \rangle)}^{\phi}, UC \rangle) \cup closure(\langle \cancel{\delta(19, \langle NT \rangle)}^{\phi}, '|', ')', \dashv \rangle)$

$| \; C = \langle 16, '|', ')', \dashv \rangle = I_{16}$

- $x = LC$

$$\vartheta(I_{12}, LC) = \text{closure}(\langle \cancelto{\phi}{\delta(11, LC)}, 'ᵧ', \dashv) \cup \text{closure}(\langle \cancelto{\phi}{\delta(9, LC)}, 'ᵧ', \dashv) \cup$$
$$\text{closure}(\langle \cancelto{\phi}{\delta(13, LC)}, '|', 'ᵧ', \dashv\rangle) \cup \text{closure}(\langle \delta(17, LC), UC\rangle) \cup$$
$$\text{closure}(\langle \cancelto{\phi}{\delta(19, LC)}, '|', 'ᵧ', \dashv\rangle)$$

$$\Big|\ C = \langle 18, UC\rangle = I_9$$

- $x = UC$

$$\vartheta(I_{12}, UC) = \text{closure}(\langle \cancelto{\phi}{\delta(11, UC)}, 'ᵧ', \dashv) \cup \text{closure}(\langle \cancelto{\phi}{\delta(9, UC)}, 'ᵧ', \dashv) \cup$$
$$\text{closure}(\langle \cancelto{\phi}{\delta(13, UC)}, '|', 'ᵧ', \dashv\rangle) \cup \text{closure}(\langle \cancelto{\phi}{\delta(17, UC)}, UC\rangle) \cup$$
$$\text{closure}(\langle \delta(19, UC), '|', 'ᵧ', \dashv\rangle)$$

$$C = \langle 20, '|', 'ᵧ', \dashv\rangle = I_{10}$$

- $x = \Sigma \cup V \cup \{\dashv\}$

$$\vartheta(I_{13}, x) = \phi$$

- $x = \Sigma \cup V \cup \{\dashv\}$

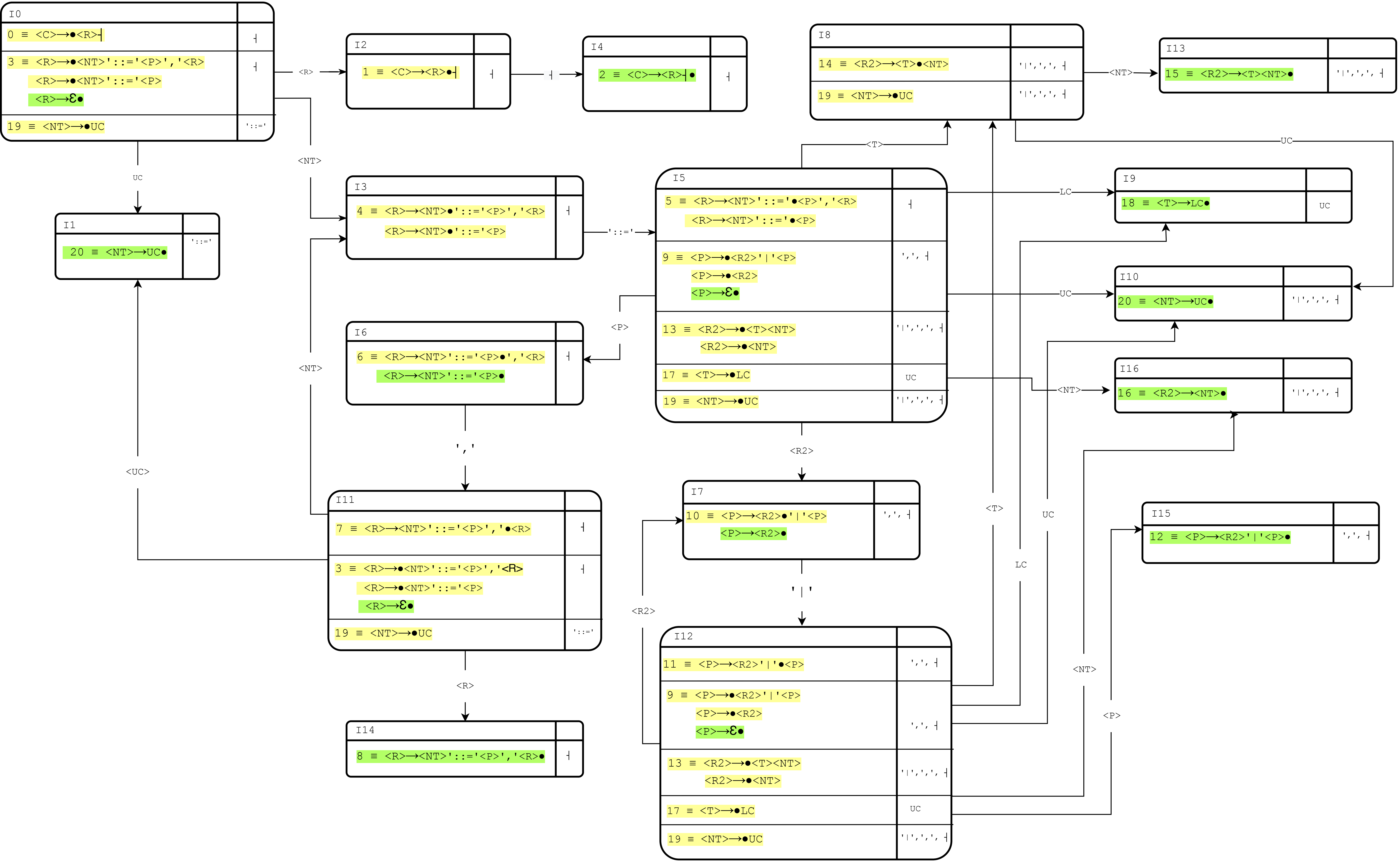
$$\vartheta(I_{14}, x) = \phi$$

- $x = \Sigma \cup V \cup \{\dashv\}$

$$\vartheta(I_{15}, x) = \phi$$

- $x = \Sigma \cup V \cup \{\dashv\}$

$$\vartheta(I_{16}, x) = \phi$$



I0
0 ≡ <C>→•<R>⊣
⊣
3 ≡ <R>→•<NT>'::='<P>','<R>
<R>→•<NT>'::='<P>
<R>→ℇ•
⊣
19 ≡ <NT>→•UC
'::='
I1
20 ≡ <NT>→UC•
'::='
I2
1 ≡ <C>→<R>•⊣
⊣
I4
2 ≡ <C>→<R>⊣•
⊣
I3
4 ≡ <R>→<NT>•'::='<P>','<R>
<R>→<NT>•'::='<P>
⊣
I5
5 ≡ <R>→<NT>'::='•<P>','<R>
<R>→<NT>'::='•<P>
⊣
9 ≡ <P>→•<R2>'|'<P>
<P>→•<R2>
<P>→ℇ•
',', ⊣
13 ≡ <R2>→•<T><NT>
<R2>→•<NT>
'|',',', ⊣
17 ≡ <T>→•LC
UC
19 ≡ <NT>→•UC
'|',',', ⊣
I6
6 ≡ <R>→<NT>'::='<P>•','<R>
<R>→<NT>'::='<P>•
⊣
I7
10 ≡ <P>→<R2>•'|'<P>
<P>→<R2>•
',', ⊣
I8
14 ≡ <R2>→<T>•<NT>
'|',',', ⊣
19 ≡ <NT>→•UC
'|',',', ⊣
I9
18 ≡ <T>→LC•
UC
I10
20 ≡ <NT>→UC•
'|',',', ⊣
I11
7 ≡ <R>→<NT>'::='<P>','•<R>
⊣
3 ≡ <R>→•<NT>'::='<P>','<R>
<R>→•<NT>'::='<P>
<R>→ℇ•
⊣
19 ≡ <NT>→•UC
'::='
I12
11 ≡ <P>→<R2>'|'•<P>
',', ⊣
9 ≡ <P>→•<R2>'|'<P>
<P>→•<R2>
<P>→ℇ•
',', ⊣
13 ≡ <R2>→•<T><NT>
<R2>→•<NT>
'|',',', ⊣
17 ≡ <T>→•LC
UC
19 ≡ <NT>→•UC
'|',',', ⊣
I13
15 ≡ <R2>→<T><NT>•
'|',',', ⊣
I14
8 ≡ <R>→<NT>'::='<P>','<R>•
⊣
I15
12 ≡ <P>→<R2>'|'<P>•
',', ⊣
I16
16 ≡ <R2>→<NT>•
'|',',', ⊣
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⊣
<NT>
UC
'::='
<T>
<NT>
UC
LC
<P>
<R2>
','
'|'
<UC>
<R>
<T>
<P>

Para que la gramática cumpla con la condición LR(1):

1. Conflicto reducción - desplazamiento:

   I_0: ∅ ∩ UC ∩ ┤ = ∅

   I_5: ∅ ∩ LC ∩ UC ∩ ‘,’ ∩ ┤ = ∅

   I_6: ‘,’ ∩ ┤ = ∅

   I_7: ‘|’ ∩ ‘,’ ∩ ┤ = ∅

   I_{11}: ∅ ∩ UC ∩ ┤ = ∅

   I_{12}: ∅ ∩ LC ∩ UC ∩ ‘,’ ∩ ┤ = ∅

2. Conflicto reducción – reducción:
   Todos los macro-estados que presentan este conflicto cumplen con esta cláusula, ya que todos son únicos.

Por lo tanto, la gramática tiene la propiedad LR(1).

Al no presentarse elementos comunes para unir macro-estados, la gramática no tiene la propiedad LALR(1).