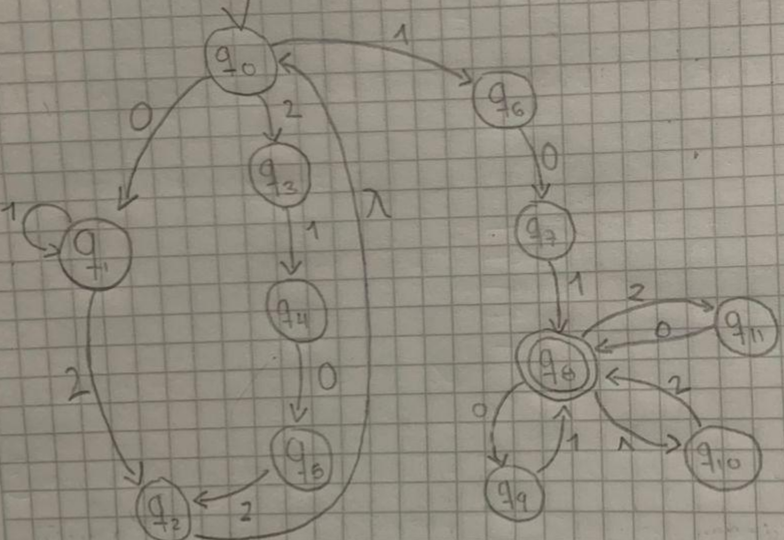
Computer Science III

Workshop 1

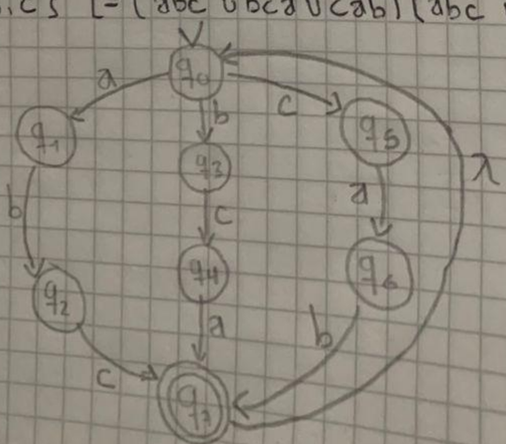
Student: Santiago Sánchez Moya 20211020032

1. For each of the following languages, define the corresponding finite-state machine:

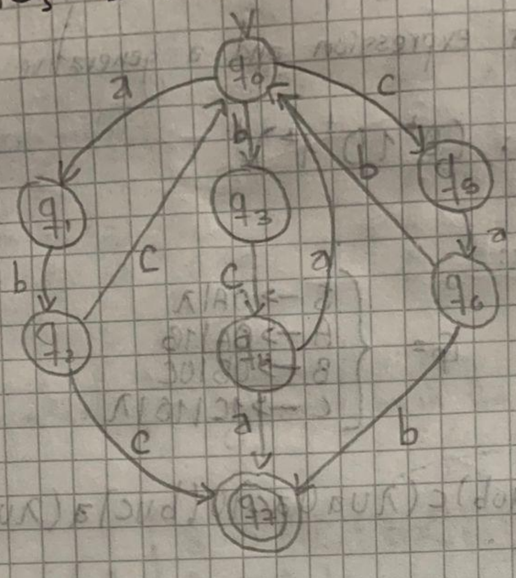
(i) $\Sigma = \{0, 1, 2\}$ $L = (01^*2 \cup 2102)^* 101 (01 \cup 12 \cup 20)^*$



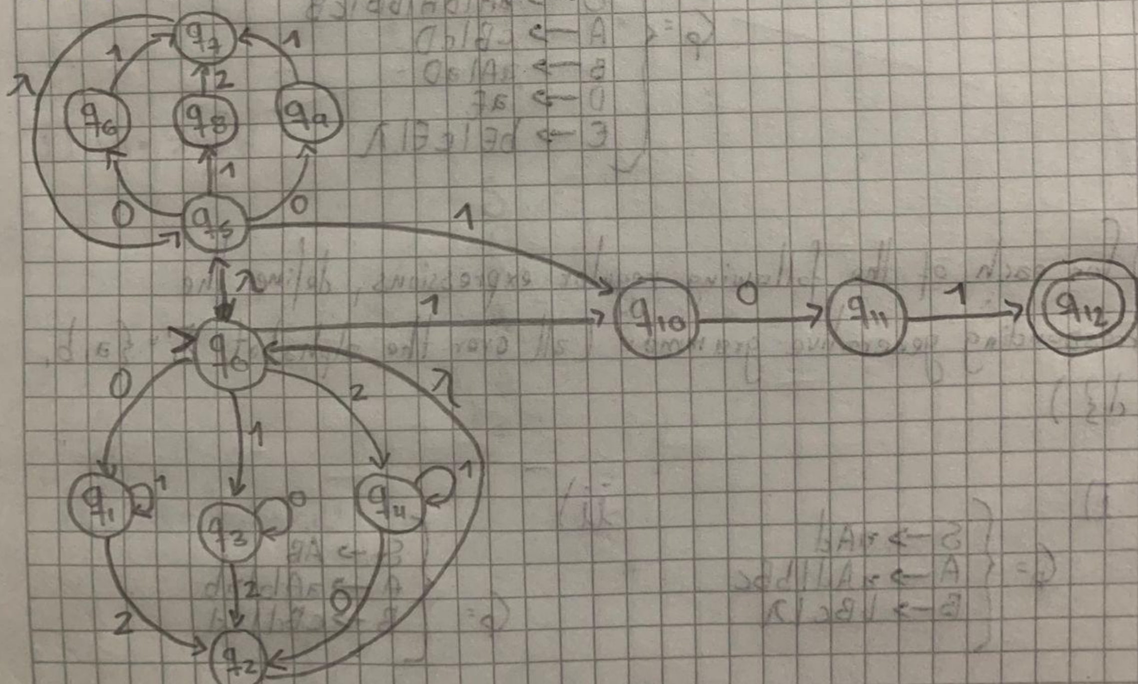
ii) $\Sigma = \{a, b, c\}$ $L = (abc \cup bca \cup cab)(abc \cup bca \cup cab)^*$



iii) $\Sigma = \{a, b, c\}$ $L = (abc \cup bca \cup cab)^* (abc \cup bca \cup cab)$




iv) $\Sigma = \{0, 1, 2\}$ $L = (01^*2 \cup 10^*2 \cup 21^*0)^* (01 \cup 12 \cup 20)^* \, 101$



2. For each one of the following finite-state machines, define the corresponding regular expression and a generative grammar.

i) regular expression: $(0^+ 1 0^+ 1^*)^*$

generative grammar:

$$G = \begin{cases} S \rightarrow 0A \mid \lambda \\ A \rightarrow 0A \mid 1B \\ B \rightarrow 0B \mid 0C \\ C \rightarrow 1C \mid 1S \mid \lambda \end{cases}$$

ii) regular expression: $((a \cup b)c(\lambda \cup a \cup ac) \cup (b \cup c)a(\lambda \cup c \cup ca))((a(b \cup c)^*) \cup \lambda)$

generative grammar:

$$G = \begin{cases} S \rightarrow aA \mid bA \mid bB \mid cB \\ A \rightarrow cB \mid cD \\ B \rightarrow aA \mid aD \\ D \rightarrow aE \\ E \rightarrow bE \mid cE \mid \lambda \end{cases}$$

3) for each of the following regular expressions, define the corresponding generative grammar (all over the alphabet $\Sigma = \{a, b, c, d\}$)

i)

$$G = \begin{cases} S \rightarrow aAd \\ A \rightarrow aAd \mid bBc \\ B \rightarrow bBc \mid \lambda \end{cases}$$

ii)

$$G = \begin{cases} S \rightarrow AB \\ A \rightarrow aAb \mid ab \\ B \rightarrow cBd \mid cd \end{cases}$$

iii)

$$G = \begin{cases} S \to A \mid D \\ A \to aBd \\ B \to aBd \mid bCc \\ C \to bCc \mid \lambda \\ D \to EF \\ E \to aEb \mid ab \\ F \to cFd \mid cd \end{cases}$$

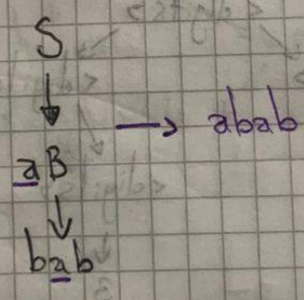
iv)

$$G = \begin{cases} S \to AB \\ A \to aAc \mid \lambda \\ B \to bBc \mid bc \end{cases}$$

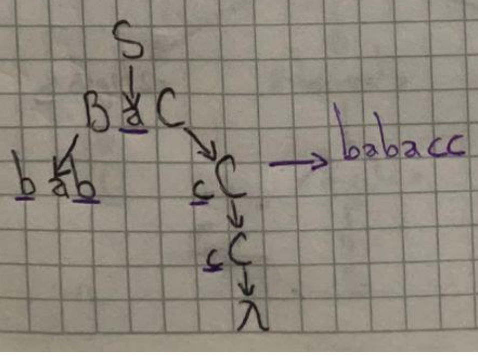
4. Let G a context-free grammar with the following productions:

$$G = \begin{cases} S \to ABC \mid BaC \mid aB \\ A \to Aa \mid a \\ B \to BAB \mid bab \\ C \to cC \mid \lambda \end{cases}$$

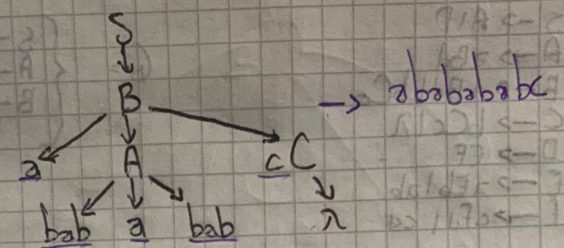
i) $w_1 = abab$




ii) $w_2 = babacc$

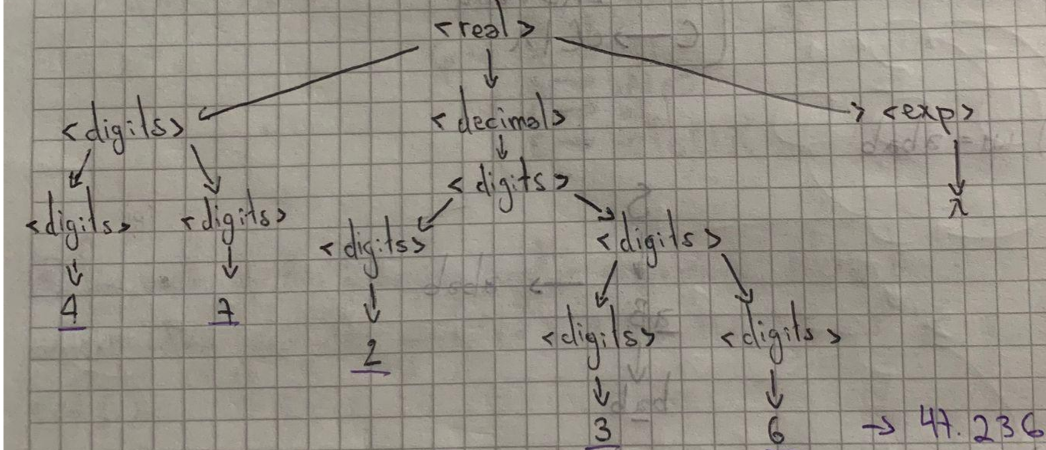


iii) $W_3$ = abababababc

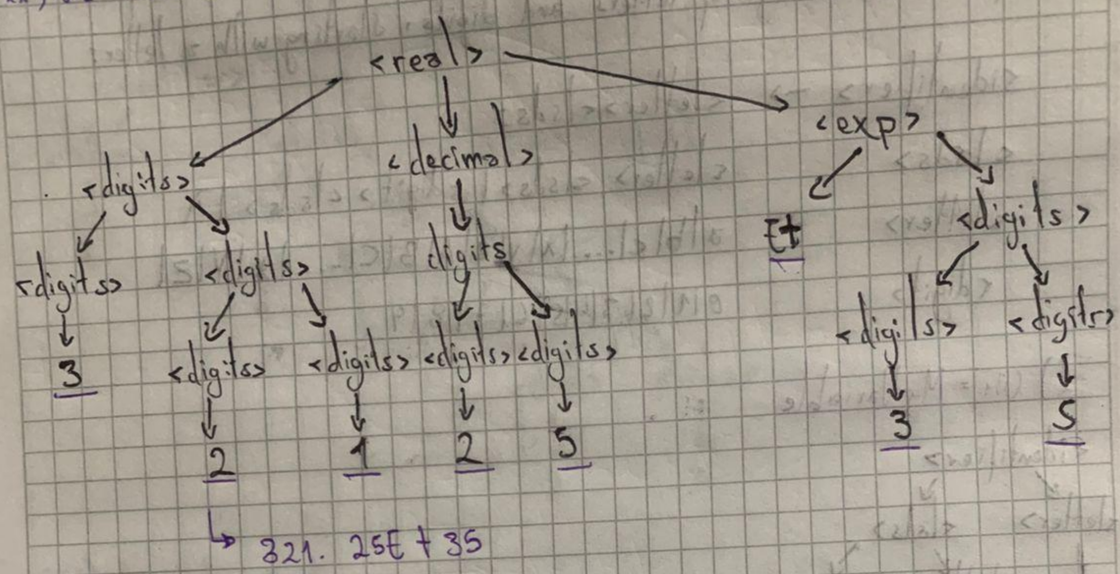



5. As follows there is a context-free grammar to generate real numbers without sign, the alphabet is $\Sigma = \{0,1,2,3,4,5,6,7,8,9,.,+,-,E\}$:

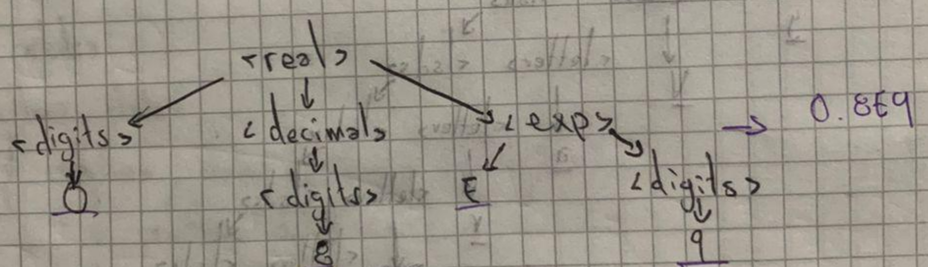
i) $W_1$ = 47.236



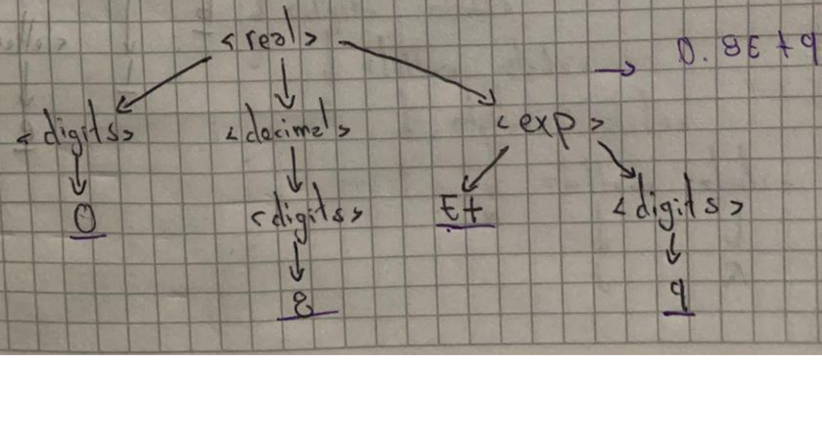
ii) $W_2 = 321.25E+35$




iii) $W_3 = 0.8E9$




iv) $W_4 = 0.8E+9$



6. The following is a context-free grammar to generate identifiers, identifiers are strings of letters and digits, starting with a letter:

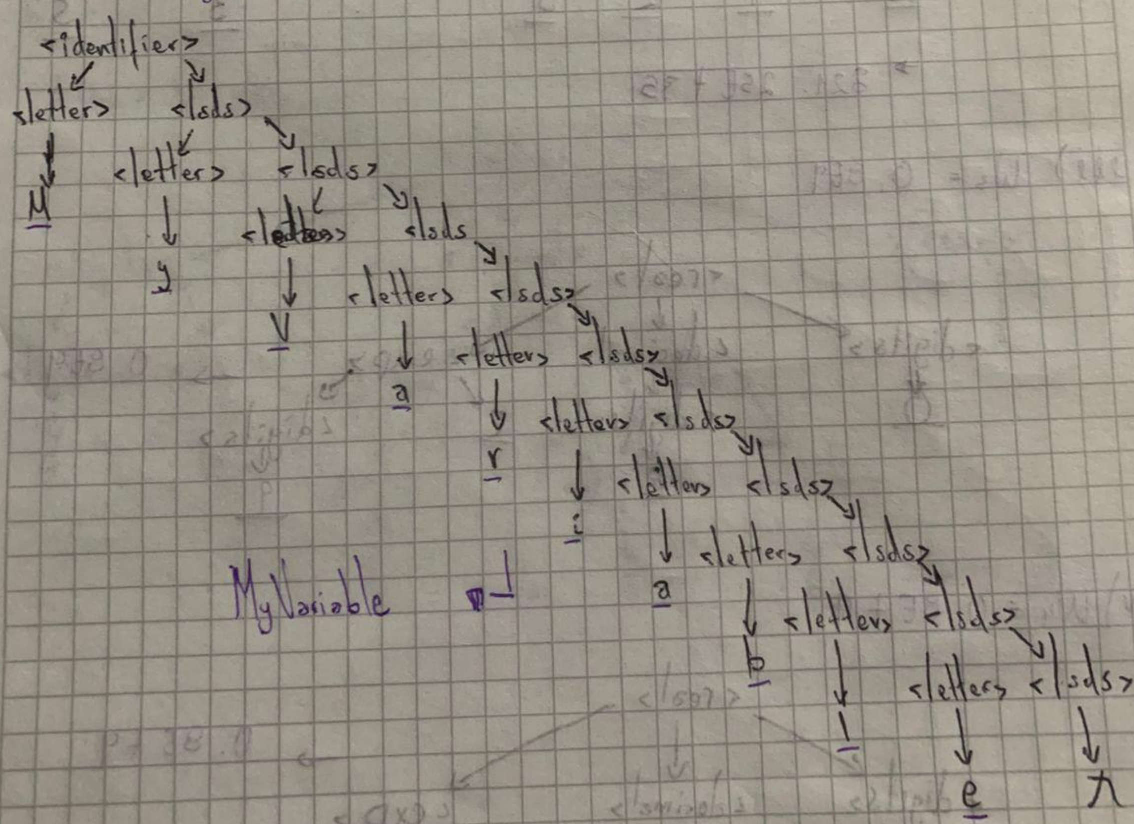
<identifier> → <letter><lsds>

<lsds> → <letter> <lsds> | <digit> <lsds> | λ

<letter> → a|b|c|... |x|y|z|A|B|C|... |X|Y|Z|

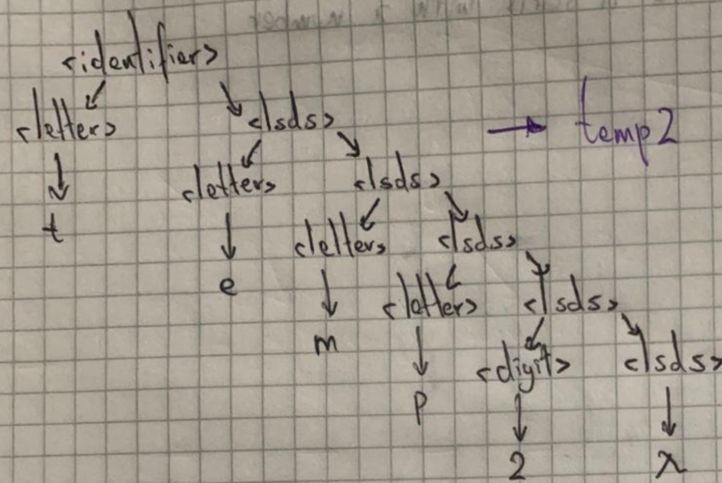
<digit> → 0|1|2|3|4|5|6|7|8|9

i) $W_1$ = MyVariable

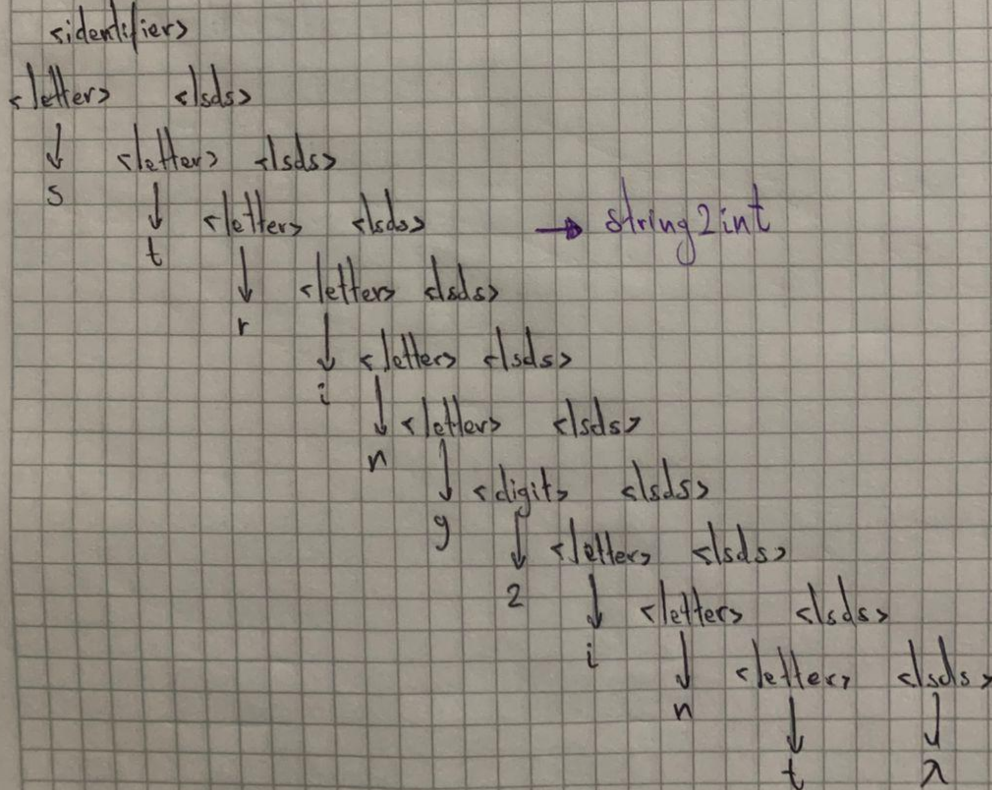



MyVariable

ii) $W_2$ = temp2




iii) $W_3$ = string2int



iv) $W_4$ = 2NotAVariable → The generative grammar given, can't generate this name, since it starts with a number