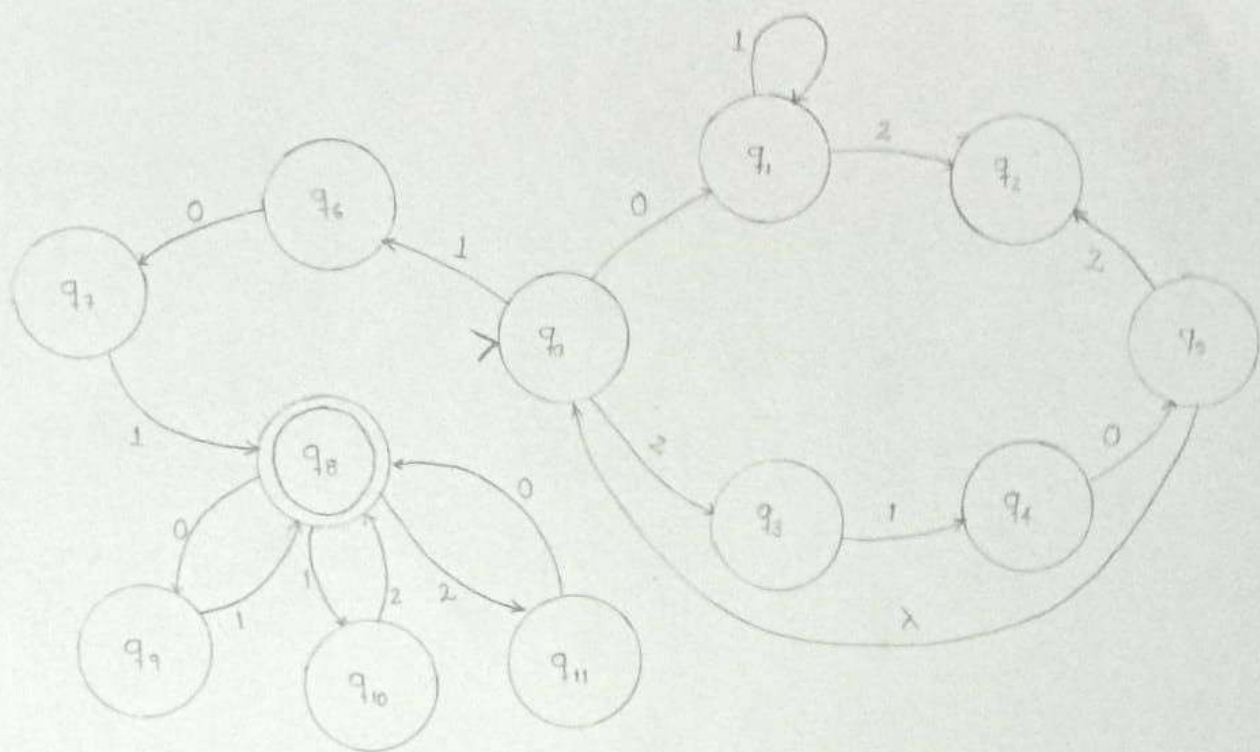
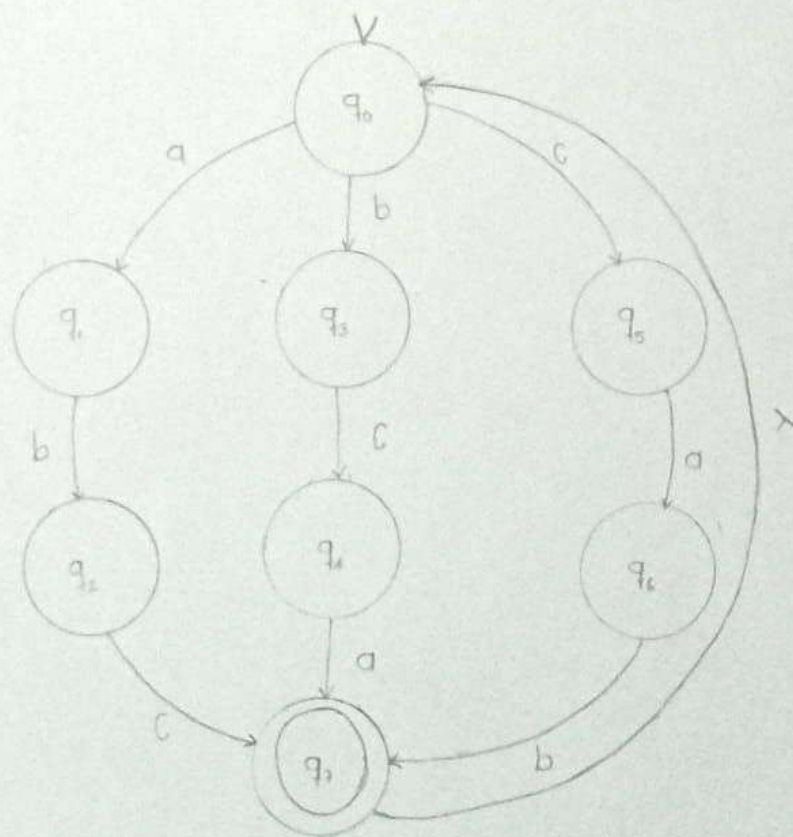


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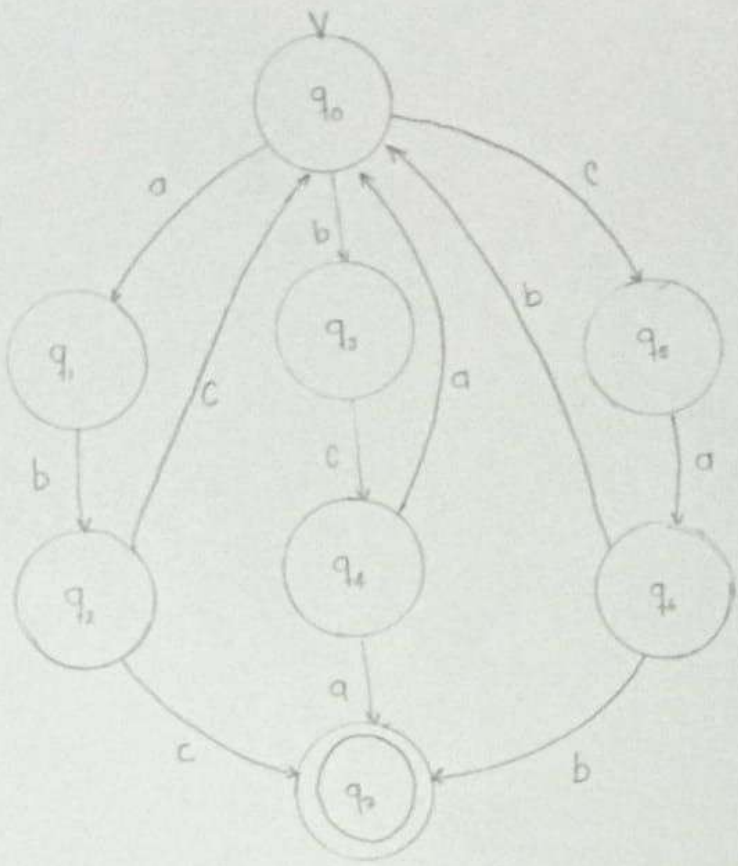
1. (i) $\Sigma = \{0, 1, 2\}$ $L = (01^*2 \cup 2102)^* 101 (01 \cup 12 \cup 20)^*$



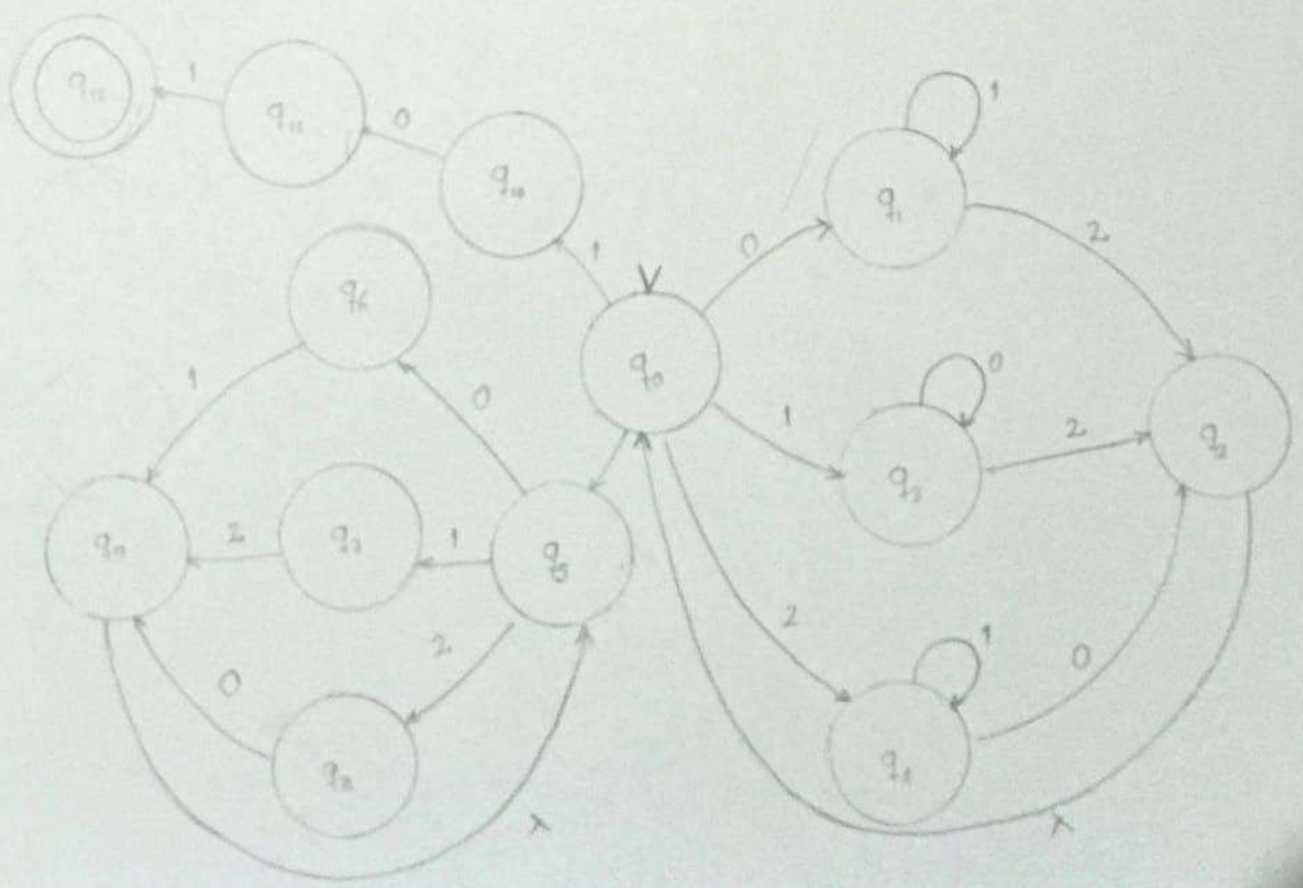
(ii) $\Sigma = \{a, b, c\}$ $L = (abc \cup bca \cup cab)(abc \cup bca \cup cab)^*$



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



(iv) $\Sigma = \{1, 2, 3\}$ $L = (01^*2 \cup 10^*2 \cup 21^*0)^*(01 \cup 12 \cup 20)^*101$



2. (i) Regular expression $\rightarrow (0^+ 10^+ 1^+)^*$

Generative grammar \rightarrow

$$G \begin{cases} S \rightarrow 0A1\lambda \\ A \rightarrow 0A11B \\ B \rightarrow 0B10C \\ C \rightarrow 1C11S1\lambda \end{cases}$$

(ii) Regular expression $\rightarrow ((a \cup b)c(\lambda \cup a \cup ac) \cup (b \cup c)a(\lambda \cup c \cup ca))((d(b \cup c)^*) \cup \lambda)$

Generative grammar \rightarrow

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

(i)

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

(ii)

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

(iii)

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

(iv)

$G \begin{cases} S \rightarrow AB \\ A \rightarrow aAC \mid \lambda \\ B \rightarrow bBC \mid bc \end{cases}$

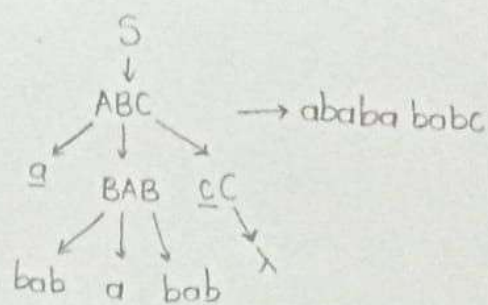
i) $w_1 = abob$

$$\begin{array}{c} S \\ \downarrow \\ \underline{a}B \rightarrow abob \\ \downarrow \\ \underline{bab} \end{array}$$

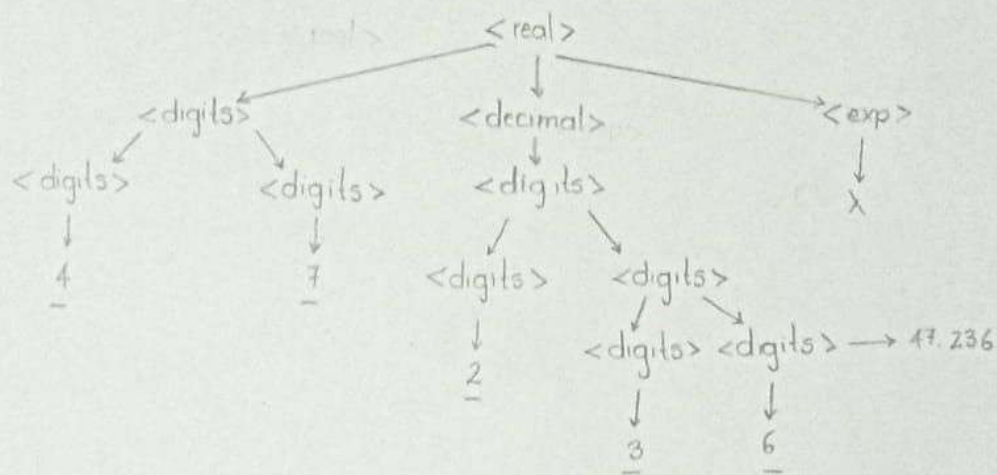
ii) $w_2 = babacc$

$$\begin{array}{c} S \\ \downarrow \\ B \underline{a} C \\ \swarrow \quad \searrow \\ \underline{bab} \quad \underline{c}C \rightarrow babacc \\ \downarrow \\ \underline{c}C \\ \downarrow \\ \lambda \end{array}$$

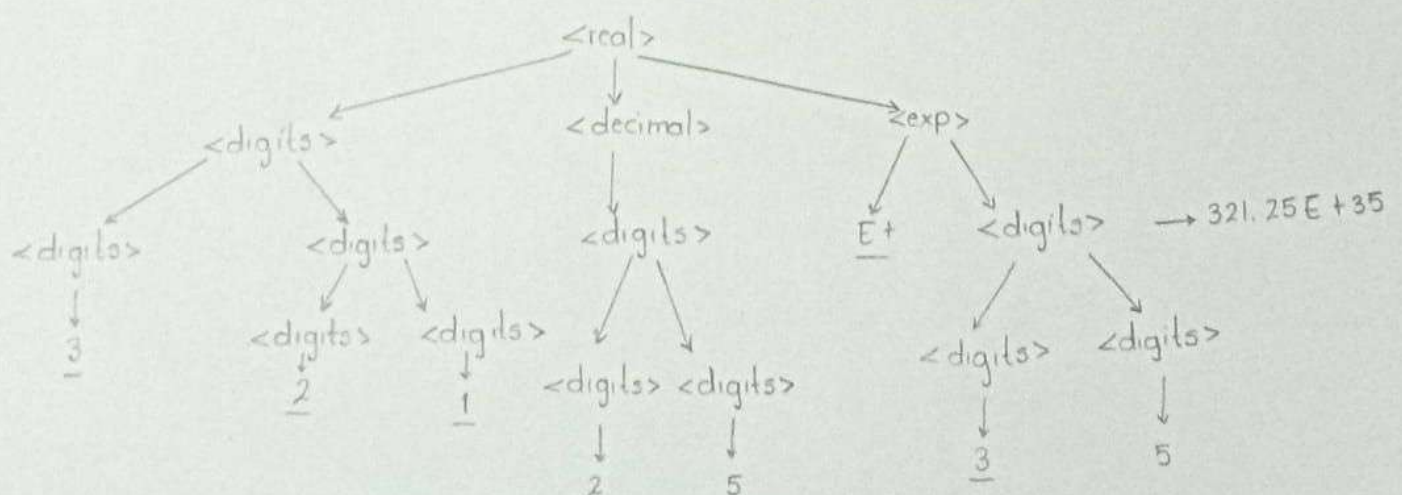
(i) $w_3 = ababababc$



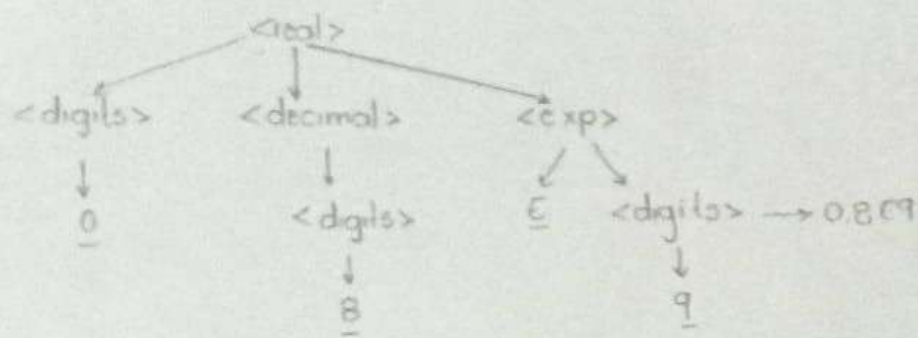
(i) $w_1 = 47.236$



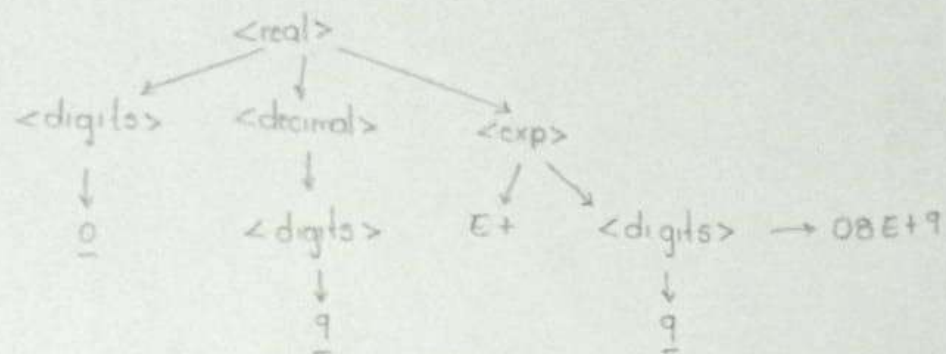
(ii) $w_2 = 321.25E+35$



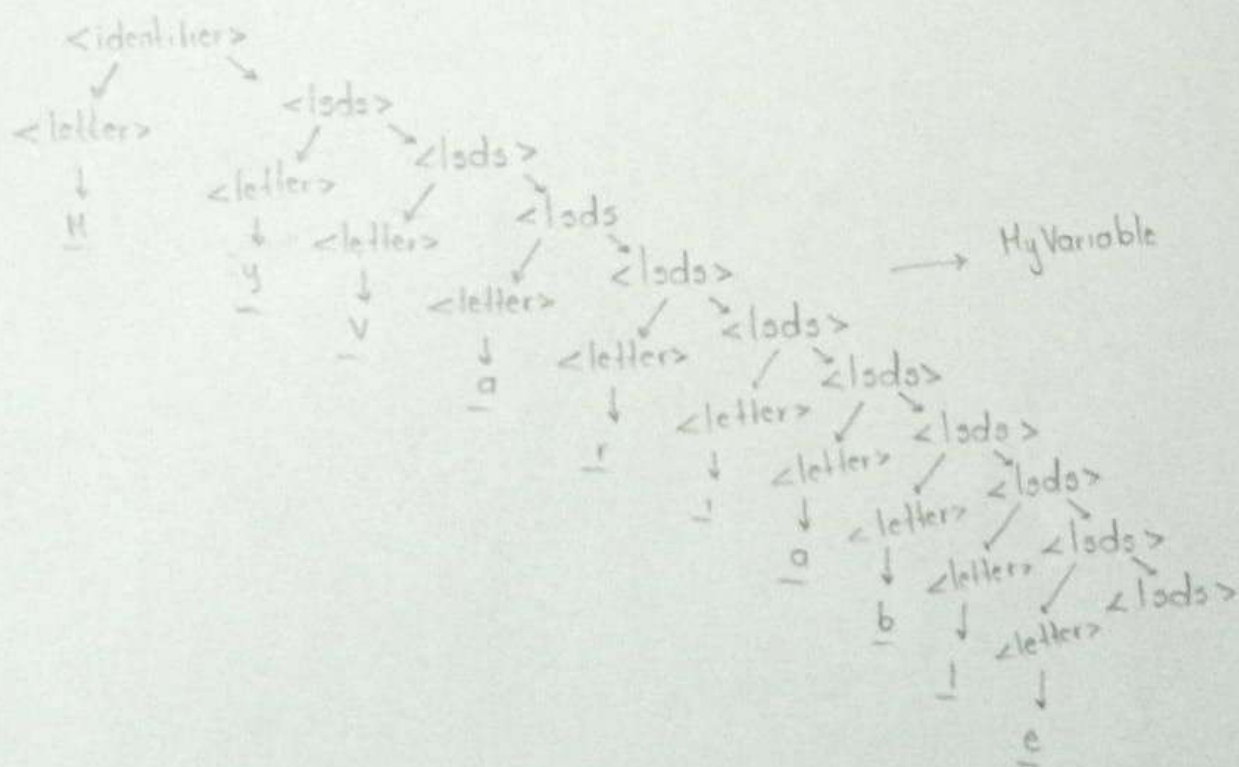
iii) $w_3 = 0.8E9$



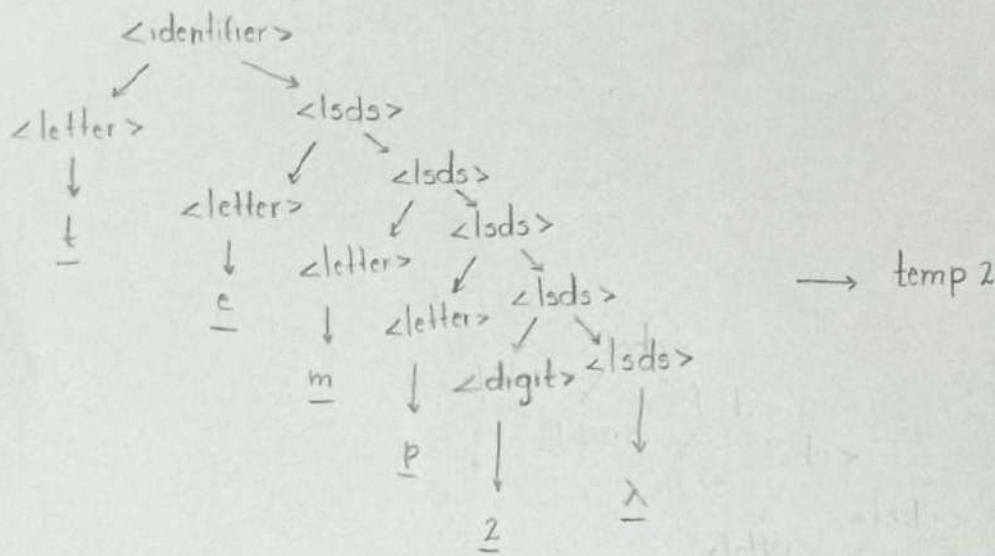
iv) $w_4 = 0.8E+9$



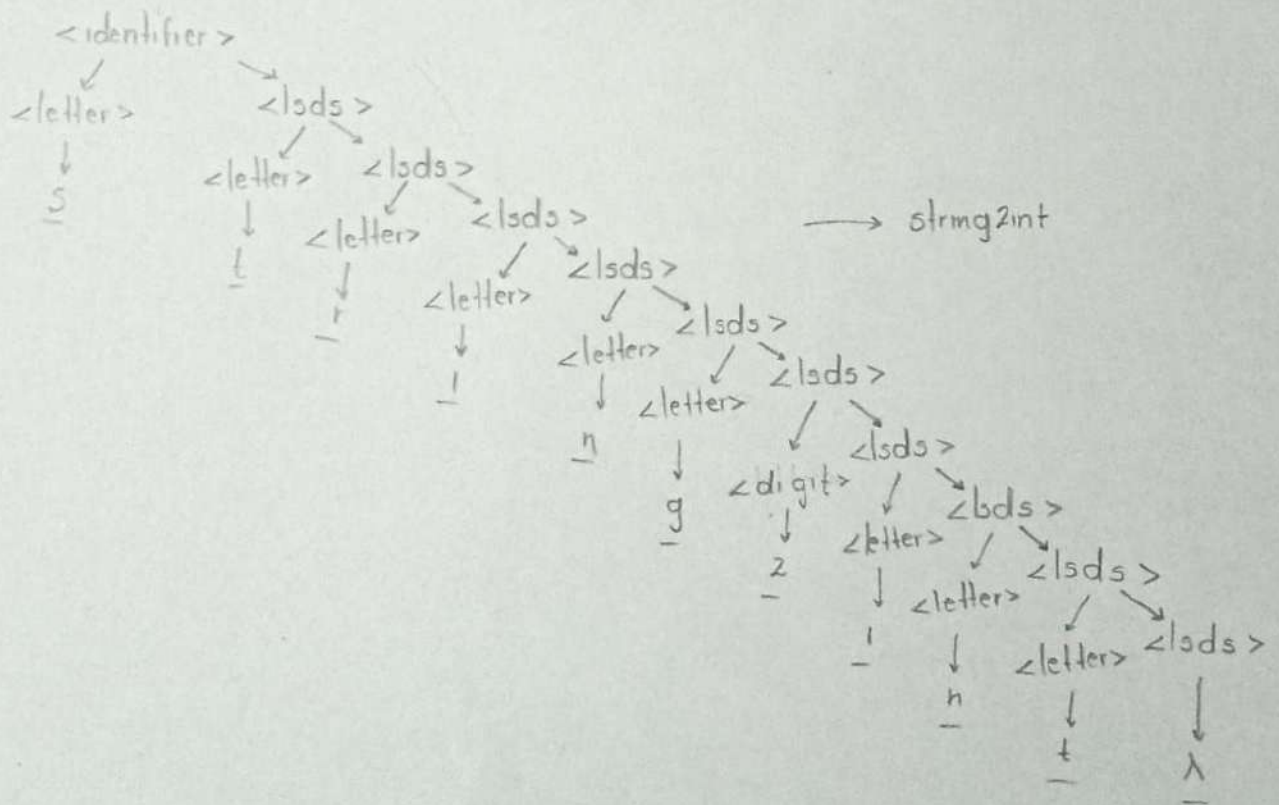
6. (i) $w_1 = HyVariable$



(ii) $w_2 = \text{temp}2$



(iii) $w_3 = \text{string2int}$



(iv) $w_4 = 2\text{NotVariable} \rightarrow$ Can't generate because it starts with a number.