Computer Science III
2024-III
WorkShop No. 1 — The Old Times

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

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

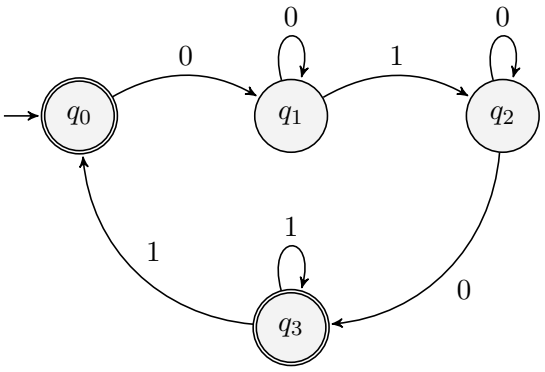
   (ii) $\Sigma = \{a, b, c\}$. $L = (abc \cup bca \cup cab)(abc \cup bca \cup cab)^*$.

   (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) $\Sigma = \{0, 1\}$.



   (ii) $\Sigma = \{a, b, c\}$.

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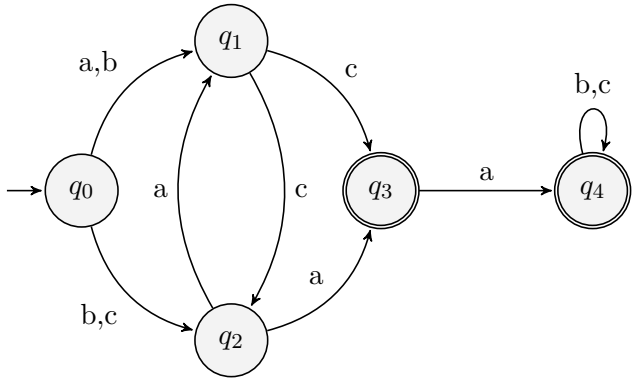
Any comment or concern related to this document could be send to Carlos A. Sierra at e-mail: *cavirguezs@udistrital.edu.co*



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

   (i) $\{a^i b^j c^j d^i : i, j \geq 1\}$.

   (ii) $\{a^i b^i c^j d^j : i, j \geq 1\}$.

   (iii) $\{a^i b^j c^j d^i : i, j \geq 1\} \cup \{a^i b^i c^j d^j : i, j \geq 1\}$.

   (iv) $\{a^i b^j c^{i+j} : i \geq 0, j \geq 1\}$.

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

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

   Found derivation trees for the following strings:

   (i) $w_1 = abab$.

   (ii) $w_2 = babacc$.

   (iii) $w_3 = abababbabc$.

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

$$\begin{array}{lcl} < real > & \to & < digits >< decimal >< exp > \\ < digits > & \to & < digits >< digits > \mid 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9 \\ < decimal > & \to & < digits > \mid \lambda \\ < exp > & \to & E < digits > \mid E+ < digits > \mid E- < digits > \mid \lambda \end{array}$$

   Define the derivation tree for the following strings:

   (i) $w_1 = 47.236$

   (ii) $w_2 = 321.25E + 35$

(iii) $w_3 = 0.8E9$

(iv) $w_4 = 0.8E + 9$

6. As follows there is a `context-free grammar` to generate **identifiers**, identifiers are strings of letters and digits, starting with a letter:

$$
\begin{array}{lcl}
< identifier > & \rightarrow & < letter >< lsds > \\
< lsds > & \rightarrow & < letter >< lsds > | < digit >< lsds > | \lambda \\
< letter > & \rightarrow & a \mid b \mid c \mid \ldots \mid x \mid y \mid z \mid A \mid B \mid C \mid \ldots \mid X \mid Y \mid Z \\
< digit > & \rightarrow & 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9
\end{array}
$$

Define the derivation tree for the following names:

(i) $w_1 = MyVariable$

(ii) $w_2 = temp2$

(iii) $w_3 = string2int$

(iv) $w_4 = 2NotAVariable$

Deadline: Saturday, 5th of October, 2024, 18:00 (local time).