Programming languages (TC-2006)

In-class activity 01

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In this activity, you will practice strings, DFAs, and grammars to define some lexical and syntactic elements of straightforward languages.

1 Set definitions (30%)

Write the set definition for the following languages. In all the cases, the alphabet is $\{w, x, y, z\}$:

A. All the strings that start with an x, followed by two y, three zs and two or more x (in that specific order). For example, the string xyyzzzxxxx must be accepted, while xzzzyyyxxx must not.

$\{xyyzzzxx^i : i > 0\} \cup \{\varepsilon\}$

B. All the strings that start with zero or more w, followed by at least one x, zero or more y and at least two z (in that specific order). For example, the string xzz must be accepted, while wyyyzz must not.

$\{w^i : i \geq 0\} \cup \{x^i : i > 0\} \cup \{y^i : i \geq 0\} \cup \{z^i : i \geq 2\}$

C. All the strings that satisfy any of the following conditions:

- Start with at least two x followed by zero or more y.
- Start with at least one x followed by at least one z and in which which the number of x equals the number of z.

$\{x^i y^j : x \geq 2, j \geq 0\} \cup \{x^i z^i : i \geq 1\}$

2 Syntax diagrams (20%)

Draw a syntax diagram for IDENTIFIER, where an identifier is a sequence that starts with a dollar sign ($), followed by one or more letters or digits and ends with a dollar sign ($).

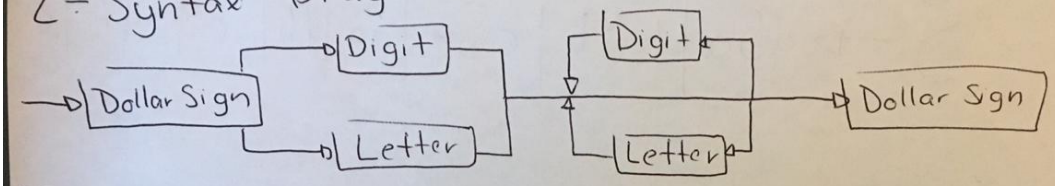
3 Deterministic finite automata (30%)

Design a DFA for each of the following languages:

A. Given the alphabet $\{0, 1, 2 \ldots, 8, 9, .\}$, it accepts all the strings that represent floating point numbers with exactly two decimals of precision. For example, the strings "123345.00", "100.05" and "0.00" must be accepted by the DFA.

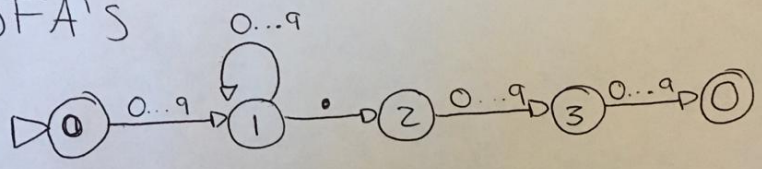
B. Given the alphabet $\{a, b, c\}$, it accepts all the strings that start with one b, followed by one or more c and ends with exactly two a.

2- Syntax Diagrams

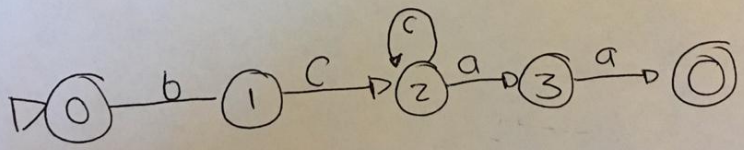


3- DFA'S

A)



B)



4 Grammars (20%)

Given the alphabet $\{a, b, c\}$ and strings of even length, design a grammar that only accepts palindromes. Please consider that the empty string is not considered a palindrome for this exercise.

Deliverables

Prepare a PDF document that contains the information requested and submit it to Canvas. **Please, do not submit other formats but PDF**.

4) Grammars $\{a, b, c\}$

$S \rightarrow aSa \mid bSb \mid cSc \mid aa \mid bb \mid cc \mid a \mid b \mid c$

I promise to apply my knowledge, strive for its development, and not use unauthorized or illegal means to complete this activity, following the Tecnológico de Monterrey Student Code of Honor.