TAREA III

EXPRESIONES REGULARES

1era Sección

① Expresar el lenguaje que corresponde a cada una de las siguientes expresiones regulares:

a) $(a+(b\cdot c))^*$

$= L[a+(L(b)L(c))]^*$

$= [L(a)+L(bc)]^*$

$= [\{a\} \cup \{bc\}]^*$

$= \{a, bc\}^*$

$= \{\lambda, a, bc, aa, abc, bca, \ldots\}$ $= \{w, w \in \{a, bc\}^*\}$

b) $(a+b+c)^* \cdot (c+\emptyset)$

$= L(L(a)+L(b)+L(c))^* \cdot (L(c)+L(\emptyset))$

$= L(\{a\} \cup L\{b\} \cup L\{c\})^* \cdot (\{c\} \cup L(\emptyset))$

$= \{a, b, c\}^* \{c\}$

$= \{\lambda c, ac, bc, cc, abc, acc, bcc, abcc, \ldots\} = \{wc, w \in \{a, b, c\}^*\}$

c) $(a+bb)^* (ba^*+\lambda)$

$= L(L(a)+L(bb))^* (L(b)L(a)^* + \lambda)$

$= L(\{a\} + \{bb\})^* \cdot L(\{b\}\{a\}^* + \lambda)$

$= \{a, bb\}^* \cdot [\{b\lambda, ba, baa, baaa\} \cup \{\lambda\}]$

$= \{\lambda, a, aa, aaa, \ldots, bb, bbb, \ldots\} \{\lambda, b, ba, baa, baaa \ldots\}$

$= \{\lambda b, ab, aab, aaab \ldots, aba, aaba, \ldots bbb, bbbbb, \ldots bbba$

$bbbaa, bbbaaa \ldots\}$

$= \{wba^n, w \in \{a, bb\}^* \; n \geq 0\}$

EXERCISES

d) $a^* + a^*(a+b)c^*$

$= a^* + a^*(L(a) + L(b))c^*$

$= a^* + a^*(\{a\} \cup L\{b\})c^*$

$= a^* + a^*\{a,b\}c^*$

$= \{a\}^* + [L(a)^*\{a,b\}c^*]$

$= \{a\}^* [\{\lambda, a, aa, aaa \ldots\}^*\{a,b\}\{\lambda, c, cc, ccc, cccc, \ldots\}]$

$= \{\lambda, a, aa, aaa, aaaa, \ldots\} \cup \{\lambda a\lambda, \ldots, \lambda b\lambda, \lambda ac \ldots \lambda abc, \ldots\}$

$= \{\lambda, a, aa, aaa \ldots, ac, acc \ldots, b, bc \ldots\}$

$= \{a^n, a^y c^x, a^n b c^n, n \geq 0, y \geq 1, x \geq 1\}$

EXERCISES

① Find all strings in $L((a+b)b(a+ab)^*)$ of length less than four

$L(L) = ((a+b)b(L(a) \cup L(ab))^*)$

$= ((a+b)b(\{a\} \cup \{ab\})^*)$

$= (L(a)+L(b)\cdot b\{a, ab\}^*)$

$= (\{a\} \cup \{b\})\{b\}\{a, ab\}^*$

$= \{a, b\}\{b\}\{a, ab\}^*$

$= \{a, b\}\{b\}\{\lambda, a, aa, aaa \ldots, ab, abab, ababab, \ldots aab, aaab\}$

$= ab, aba, bb, bba, \ldots$

⑦ What languages do the expressions $(\emptyset^*)^*$ and $a\emptyset$ denotate?

① $L(\emptyset^*)^*$ $\qquad \emptyset^* = \{\lambda\} \cup \{\emptyset\} \cup \{\emptyset\emptyset\} \ldots$

$= (L\{\emptyset\}^*)^*$

$= \{\lambda, \{\}, \{\}\{\}, \{\{\}\{\} \ldots\}^* = \{\lambda\}^* = \{\lambda, \lambda, \lambda\lambda, \lambda\lambda\lambda \ldots\} = \{\lambda\}$

② $L(a\emptyset)$

$= L\{a\{\}\}$

$= \{a\} = \emptyset$

⑧ Give a simple verbal description of the language

$L((aa)^*b(aa)^* + a(aa)^*ba(aa)^*)$

$= L(\{aa\}^*\{b\}\{aa\}^* + [\{a\}\{aa\}^*\{ba\}\{aa\}^*]$

$= L(\{\lambda, aa, aaaa \ldots\}\{b\}\{\lambda, aa, aaaa, \ldots\} \cup [\{a\}\{\lambda, aa, aaaa \ldots\}\{ba\}\{\lambda, aa, aaaa \ldots\}]$

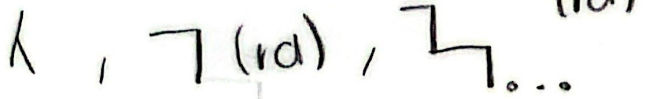
$= \{\lambda b\lambda, baa, baaaa \ldots aab, aabaa \ldots\} \cup \{a\lambda ba\lambda, aaaba\lambda, \ldots a\lambda baa, \ldots\}$

$= \{\lambda b\lambda, baa, baaa \ldots abb, aabaa \ldots, a\lambda ba\lambda, aaaba\lambda, a\lambda baa\}$

→ cadenas con n veces aa seguidas de una b, agregando de nuevo n veces aa, con cadenas con a impar seguidas de ba y seguidas de n veces aa con $n \geq 0$

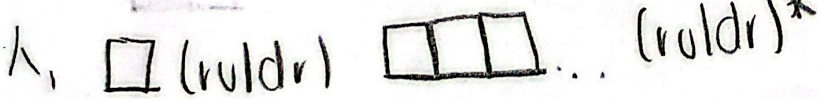
(24) Formal languages can be used to describe a variety of two dimensional figures. Chain code languages are defined on the cartesian plane $\Sigma = \{u, d, r, l\}$ where these symbols stand for unit-length straight lines in the direction up, down, right and left, respectively. An example of this notation is urdl, which stands for a square. Draw pictures of the pictures denoted by the expression $(rd)^*$, $(urddru)^*$, $(ruldr)^*$

① $(rd)^*$



② $(urddru)^*$

③ $(ruldr)^*$



2da Sección

④ Find a regular expression for the set $\{a^n b^m : n \geq 3, m \text{ is even}\}$

$r = L(aaa)a^*(bb)^*$

⑤ Find a regular expression for the set $\{a^n b^m : (n+m) \text{ is even}\}$

$r = L((a)(aa)^*b(bb)^*) + (aa)^*(bb)^*$