

Pt2 of csc304

part 2

(5.1) $L = \{\epsilon, a, b, aa, ab, ba, bb, \dots\}$
 $\epsilon + atb + aa + abtba + bb$
 $(\epsilon + atb)^+ L^+ + atb$

ii) $(a+b)(atb)^+$
 iii) $a(atb)^+ b + b(atb)^+ a$
 iv) $a(atb)^+ a + b(atb)^+ b$

16. A regular expression is a sequence of characters that define a search pattern.

Identities of Regular expression

L1: $\emptyset + R = R$

L2: $\emptyset R + R = R$

L3: $\epsilon R = R = R \epsilon$

L4: $R^+ = R$ and $R^+ = R^+$

L5: $R + R = R$

L6: $R^+ R^+ = R^+$

L7: $RR^+ = R^+ R$

L8: $(R^+)^+ = R^+$

L9: $\epsilon + RR^+ = \epsilon + R^+ R = R^+$

L10: $(PQ)^+ = P(PQ)^+ Q$

L11: $(P+Q)^+ = (P^+ Q^+)^+ = (P^+ + Q^+)^+$

L12: $(P+Q)R = PR + QR$ and

$R(P+Q) = RP + RQ$

17. (c) $\{ \epsilon, a, b, ab, ba, \dots \}$

18. i) $r = b^+ = \{ \epsilon, b, bb, bbb, \dots \}$

ii) Let $r = a^+ = \{ \epsilon, a, aa, aaa, \dots \}$ consists of all positive powers of a excluding the empty word.

iii) Let $r = a^+ b^+ = \{ \epsilon, a, aa, aaa, \dots \}$ consists of a or any word in b .

iv) Let $r = (a+ab)^+ = (a+ab)^+ (a+ab)^+ L(a+ab) = \{ a \} \cup \{ b \}$

The language consists of all words a and b .

v) Let $r = a^+ (a+ab)^+ = L = \{ a^+ b, a^+ ab, \dots \}$ In the regular expression your word must start and start with "a".

20) Any set represented by a regular expression is called a regular set.

- i) $L(A)$: a string in $L(A, K)$ is a string from K followed by a string from A .
- ii) a string in $L(A^*)$ is a string obtained by concatenating n elements for some $n \geq 0$.

21)

i) $\{0, 10\}$: union of $\{0\}$ and $\{10\}$ then we have $0 + 10$.

ii) $\{I, II, III, \dots\}$ rep. set $\{1\}^*$

iii) $\{abb, a, b, bba\}$ is rep by $abb + a + b + bba$

iv) $\{110\}$: rep by 1 followed by 1 and 0

v) $\{b^m a b^n \mid m \geq 0, n \geq 0, m \neq 0, n \geq 0\}$

vi) $\{\epsilon, a, aa, aaa, \dots\}$

ϵ followed by a^*

$\epsilon + a + aa + aaa + \dots$

vii) $\{\epsilon, 10\}$: $\epsilon + 10$

22) Grammar are finite set of rules used to describe languages, grammar is a generation of language.

i) Grammar are finite set of rules used to describe language. While language is a set of strings generated by grammar.

24) $S \Rightarrow w_1 \Rightarrow w_2 \Rightarrow \dots \Rightarrow w_n \Rightarrow w$ is a derivation of the sentence w .

The strings S, w_1, w_2, w_n which contain variables as well as terminals are called sentential derivation of strings in grammar.

Example

$G = \{S, a, b, P\}$

is called

followed

concatenation

and

have

with p given by

$$S \rightarrow a^i b^j$$

$$S \rightarrow \lambda$$

$$S \rightarrow a^i S b^j \rightarrow a^i a^k b^j \rightarrow a^{i+k} b^j$$

$$S \Rightarrow a^i b^j$$

$$S \rightarrow a^i S b^j \Rightarrow a^i a^k S b^j \Rightarrow a^i a^k a^l b^j \Rightarrow a^i a^k a^l b^j$$

$$S \Rightarrow a^i S b^j \Rightarrow a^i a^k S b^j \Rightarrow a^i a^k a^l S b^j \Rightarrow a^i a^k a^l a^m b^j$$

$$\Rightarrow a^i a^k a^l a^m b^j$$

$$(A, a^i a^k a^l a^m b^j, a^i a^k a^l a^m b^j, \dots) \text{ for } i, k, l, m \geq 0$$