CSE331

Assignment 1

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Section: 16

Answer:

a. $L_1 = \{ w \in \{0,1\}^* \; 0^i 1^j \text{ where } i > j \}$

Assume L_1 is a regular Language

P the pumping length.

$L_1 = 0^{P+1} 1^P$

$P = 4$

$L_1 = 0^{4+1} 1^4$

$= 000001111$

the pumping lemma $xy^iz \in L_1$

when $i = 0$. it $xy^0z = xz$

remove the ~~the~~ string y decrease the number of 0, when xz there are

can not have more 0 than 1 , it not ~~regular~~ member of L_1.

~~Dont~~ so L_1 is not regular

(b)

$L_2 = \{ w \in \{0,1\}^* \; 0^i 1^j \text{ where } i < j \}$

$\{ 0011, 00111 \ldots \}$

Suppose L_2 is regular.

$L_2 = 0^{3p-1} 1^p$

$x = 0^\alpha \quad y = 0^\beta \quad z = 0^{3p-1-\alpha-\beta} 1^p \quad [\beta \geq 1]$

$xy^iz = 0^\alpha 0^{i\beta} 0^{3p-1-\alpha-\beta} 1^p$

$= 0^{3p-1-\beta+i\beta} 1^p \in L_2$

$3p - 1 + i\beta - \beta < 3p$

$\Rightarrow -1 + i\beta - \beta < 0$

$\Rightarrow i\beta - \beta < 1$

$\Rightarrow \beta(i-1) < 1$

if $i = 2$

$2\beta - \beta \geq 1$

$\beta \geq 1$

$\therefore L_2$ is not regular.

c. $L_3 = \{w \in \{0,1,2\}^* : 0^n 1^n 2^n \text{ where } n \geq 0\}$

$L_3 = \{\varepsilon, 012, \ldots\}$

Assume L_3 is a regular language.

Pumping length is m

$s = 0^m 1^m 2^m$

$m = 4$ so $s = 0^4 1^4 2^4$

$s = 000011112222$

Case 1.

$\underbrace{0}_{u}\underbrace{00}_{v}\underbrace{0111}_{x}\underbrace{22}_{y}\underbrace{2}_{z}$

$uv^i x y^i z$

$i = 2 \qquad uv^2 x y^2 z$

$000\,00\,0111\,22\,2$

$0^6 1^4 2^5 \notin L_3$

Case 2

$\underbrace{0}_{u}\underbrace{000111}_{v}\underbrace{1}_{x}\underbrace{1}_{y}\underbrace{2222}_{z}$

$uv^i xy^i z$

$i = 2 \quad uv^2xy^2z$

$00\,00111001111112222 \notin L_3$

$0^6 1^7 2^4$

So there not equal number of 0, 1, 2.

it is violated the pumping lemma.

we can say that L_3 is not regular language.

d. $L_4 = \{ w \# w_2 \text{ such that } |w_1| = |w_2| \}$

when $\{0,1\}$

Suppose L_4 is regular.. p is pumping length.

$L = 0^p 1 0^{p+p!} 1$

$|L_1| = 2 + 2p + p!$

If $p < 2$ then $p = \max(2, p)$

all the decompose of L into xyz

$x = 0^\alpha$

$y = 0^\beta \quad \beta \geq 1$

$z = 0^{p-\alpha-\beta} 1 0^{p+p!} 1$

$xy^i z \notin L$

$xy^i z = 0^\alpha 0^{i\beta} 0^{p-\alpha-\beta} 1 0^{p+p!} 1$

$= 0^{p+i\beta-\beta} 0^{p+p!} 1$

$p + (i-1)\beta \neq p + p!$

$\Rightarrow i \neq \frac{p!}{\beta} + 1 \quad \left[\frac{p!}{\beta} \text{ is integer}\right]$.

then beta ~~and~~ is between 1 and p and

it divides ~~p~~ factorial is one time ~~faci time~~. also

or it integer or not ~~.~~ it is integer

then i is not equal to this.

so $i = \frac{p!}{\beta} + 1$

~~the~~ string is both site equal

~~so Lq is~~