Formal Languages week3

Michelle Bergin

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1 Chap 2 (pp58-60): 1,5,6,10,12,13,14,23

1 Give a recursive definition of the length of a string over Σ. Use the operation from the definition of a string.

i) Basis: $\lambda \in \Sigma$

ii) Recursive step: u and v are any $w \in \Sigma^*$ or concatenation of any number of letters so w^n is the length..?

I have no idea what I am doing...

5 Let L be the set of strings over $\{a, b\}$ generated by the recursive definition

i) Basis: $b \in L$

ii) Recursive step: if u is in L then $ub \in L$, $uab \in L$, and $uba \in L$, and $bua \in L$.

(a) List the elements in the sets L_0, L_1, and L_2.

$L_0 = \{b\}$

$L_1 = \{ub, uab, uba, bua, b\}$

$L_2 = \{bb, ubb, bab, uabab, ubaba, bbuaa, uabb, ubab, buab, ubaab, buaab, buaba, b\}$

(b) Is the string *bbaaba* in L? If so, trace how it is produced. If not explain why not.

uba or bua

$buaba$ or $buaba$

$bbuaaba$

No I can not create that string because I can not turn u into λ. There will always be one more b than a's

(c) Is the string *bbaaaabb* in L? If so, trace how it is produced. If not explain why not.

ub

$uabb$

buabb

The same problem exists. There will always be ONE more b than a.

6 I am not writing the whole problem out but I am confused. It says that the rules must always be that there is at least ONE b and an even number of a's before the first b. So why is bab used as an acceptable answer? I think this must be a typo and they meant aab.

i) Basis: $b \in L$

ii) Recursive step: if u is in L then $aa * u \in L$, $aa * ub* \in L$, $aa * b * u \in L$.

iii) Closure: a string v is in L only if it can be obtained from the basis by a finite number of iterations of the recursive step.

10

12

13 Let $L_1 = \{aaa\}^*$, $L_2 = \{a, b\}\{a, b\}\{a, b\}\{a, b\}$, and $L_3 = L_2^*$. Describe the strings that are in the languages L_2, L_3, and $L_1 \cap L_3$

I don't know what it means to describe but I hope this is close:

L_2 is the language of only the set of sets of a and b only.

L_3 is the same as above but each iteration will be the list of $L_2 \times L_2$

$L_1 \cap L_3$ Will be all elements of L_1 and L_3 as since I don't see an overlap... :/

14 The set of strings over $\{a, b, c\}$ in which all the a's precede the b's, which in turn precedes the c's. It is possible that there are no a's, b's, or c's.

$\{a^n b^m c^r | n = m = r \geq 0\}$

23 The set of strings over $\{a, b, c\}$ that begin with a, contain exactly two b's, and end with cc.

Basis: $\{abbcc\}$

$\{a\}\{a, b, c\} * \{bb\}\{a, b, c\}^*\{cc\}$

Something like that....