

John Spicer

I pledge my honor that I have abided by the Stevens Honor System

10/27/15

John Spicer CS334 HW #3

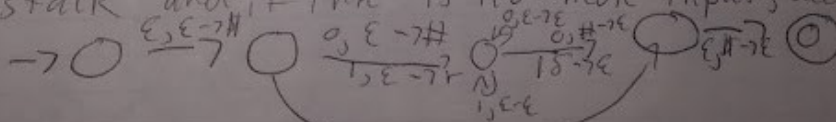
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2.2 a. Both $A + B$ are context free
 $A \cap B = \{a^n b^n \mid n \geq 0\}$, not context free
the class cannot be closed under the intersection operator

2.2 b. Assume the class of CFL is closed under the complement operator. $A + B$ are context free, so $A + B$ are context free. the class of CFL is closed under union so $A \cup B$ is CF. $\therefore A \cup B$ must be CF. DeMorgan's Law is $A \cap B = \overline{A \cup B}$ but $A \cap B$ is not CF as shown in 2.2 a. \therefore the assumption is false.

2.5 b. $\{w \mid w \text{ starts + ends w/ the same symbol}\}$
First push down a $\#$ to symbolize the stack being empty. This will be popped off when the string is emptied. Check if string is 1 character long, in which case it is accepted, then push $\#$ onto the stack and continue until the last character. If the last matches the first, pop off the symbol from the stack and if there is no more input, accept.



2.14

$A \rightarrow BAB|B|\epsilon$
 $B \rightarrow \emptyset|\epsilon$

$P \rightarrow A$
 $A \rightarrow BAB|B|\epsilon$
 $B \rightarrow \emptyset|\epsilon$

$P \rightarrow A$
 $A \rightarrow BAB|BA|AB|A|B|\epsilon$
 $B \rightarrow \emptyset$

$P \rightarrow A|\epsilon$
 $A \rightarrow BAB|BA|AB|A|B|BB$
 $B \rightarrow \emptyset$

$P \rightarrow BAB|BA|AB|\emptyset|BB|\epsilon$
 $B \rightarrow \emptyset$

$U \rightarrow \emptyset$
 $P \rightarrow BAB|BA|AB|UU|BB|\epsilon$
 $B \rightarrow UU$

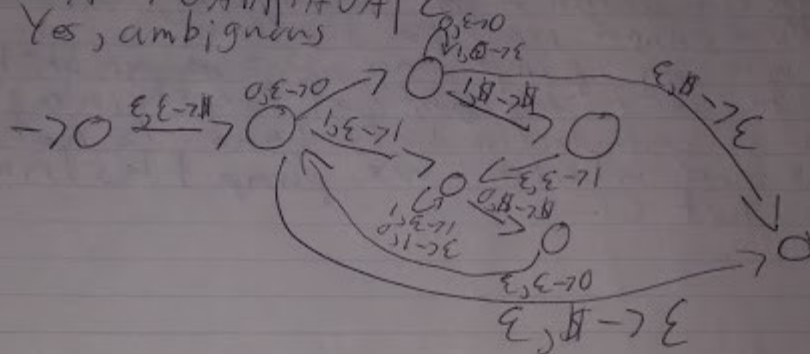
$V \rightarrow AB$
 $U \rightarrow \emptyset$
 $P \rightarrow BAB|BA|AB|UU|BB|\epsilon$
 $B \rightarrow UU$

2.26 Create a Start Variable and form a string using substitutions according to the productions. Every production either creates two variables or a terminal. It takes $n-1$ steps to grow the string from the start to n variables, and another n steps to change the variables to terminals, it must take $2n-1$ steps to derive string w of length n .

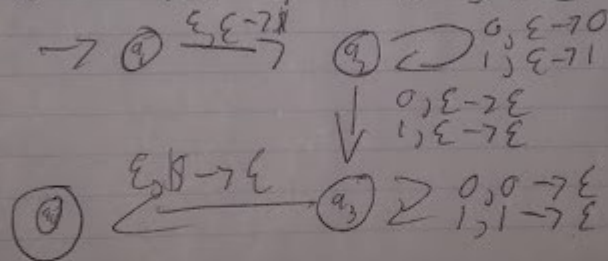
Construct:

$S \rightarrow A$
 $A \rightarrow 0A1$
 $A \rightarrow 0A1A0A1 \mid A0A1 \mid \epsilon$
 Yes, ambiguous

Construct:



Mod: $\epsilon w C 0111 w^R / w \in \{0, 1\}^*$



230 a. $\{0^n 1^n 0^n 1^n | n \geq 0\}$ p is pumping length

$0^p 1^p 0^p 1^p$ must be in language
Assume Lang is CF

1. $S = uvxyz$ $|u| + |x|$ is long enough so $uvxyz$ ^{for all}
 S is in the language i20

2. $|v| > 0$

3. $|v| < p$

wherever we pump the string, there will
be an uneven # of zeros, ones, or zeros ones.
We cannot reach so far that
we can pump ones or zeros on both
the left & right of the string. This
is a contradiction so the lang. is not CF
because wherever we pump the string, it
is not CF

2.32 Assume $lang$ is CF. P is pumping length.

$$s = 1^p 3^p 2^p 4^p \in C$$

1. $s = uvxyz$ which is long enough so
 $s = uv^i xy^i z$ for all $i \geq 0$

2. $|v| > 0$

3. $|vxy| \leq p$

Wherever the string is pumped, a contradiction occurs. If $|z|$ or z is pumped they are not even length, same for 3 or 4. This contradiction means the lang is not CF and the assumption is false.