Jalen Powell

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COMP 4200

Assignment 6

Graphical user interface, text, application

Description automatically generated

Ans:

We can prove by Contradiction that the language above is not context-free. We must first show the language as context-free so our pumping lemma will prove it. Using the terms w = uv­­ixyiz, we can assign ‘uvxy’ to the leftmost 0’s in the language and ‘z’ to the rest. 0n cannot be pumped up or down as it will not satisfy with the other grammar in the language. 02n  and 03n depends on the leftmost 0’s.

Text

Description automatically generated

Ans:

In the language above, it can be simplified to B = {03n#03n | n>= 0}. This shows that the # of 0’s will be equal on both sides of the ‘1’. Using this, we can construct a context-free grammar:

S -> ASA | 1

A -> 000

This allows recursion after giving the three 0’s alongside the 1 in the language. B is context-free.

Graphical user interface

Description automatically generated with medium confidence

Ans:

For the language C = {w -> {0,1} | #w(0) = #w(1)}, the number of 0’s and 1’s must be equal and be a palindrome. Some acceptable strings for this language would be ({}, 1001, 0110, 10011001, 01100110,etc). Looking at the sample string of 1001, we can look at like 1p 02p 1p. In the first case, we can assign uvixyi = 1p and z = 02p1p. Pumping up or down will not keep the string in the language as the rest of the string depends on the first set of 1’s. This proves that the language is not context-free.

Ans:

While looking at this language, I thought of 2 cases that that will prove through pumping lemma that it is not context-free. Case 1 would look like the following,

D = (1,2)n(3,4)m and uvixyi = 1 and z = 2, 3, and 4

This will lead the string not belonging to the language as the number of 1’s will not equal the number of 2s. The next case is,

Uvixyi = 1,2,and 3, and x = 4

This will also take the string out of the language as the number of 1s and 2s equal, but the 3s will not equal the 4s.