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CS4110
Homework 6
Due October 19

P01. Leftmost Derivation

Find the leftmost derivation for the word “abbabaabbbabbab” in the grammar
S -> SSS | aXb
X -> ba | bba | abb

S => **SSS**
=> **aXb**SS
=> a**bba**bSS
=> abbab**aXb**S
=> abbaba**abb**bS
=> abbabaabbb**aXb**
=> abbabaabbba**bba**b

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P02. Pushdown Automata

Consider the following deterministic PDA, using a trace table like those in chapter 14, page 305, show what happens to the INPUT TAPE and STACK as each of the following words proceeds through the machine: "**abb**" and "**abab**".

STATE	STACK	TAPE
START	Δ	abbΔ
READ 1	Δ	~~a~~bbΔ
PUSH a	aΔ	~~a~~bbΔ
READ 2	aΔ	~~ab~~bΔ
READ 3	aΔ	~~abb~~Δ
POP	Δ	~~abb~~Δ
READ4	Δ	~~abb~~Δ
POP	Δ	~~abb~~Δ
ACCEPT	Δ	~~abbΔ~~

STATE	STACK	TAPE
START	Δ	ababΔ
READ 1	Δ	~~a~~babΔ
PUSH a	aΔ	~~a~~babΔ
READ 2	aΔ	~~ab~~abΔ
Read 3	aΔ	~~aba~~bΔ
REJECT	aΔ	~~aba~~bΔ

What is the language accepted by this PDA?

The first section of the PDA awill accept any number of **a**s and push them, then when it reads a **b** it stops this cycle. Then it allows another b and pops an **a** off. It cycles reading **bb** and popping off another **a** until it runs out of **b**s. If it reads anything but a null after it rejects.

This PDA accepts $\mathbf{a^n\ b^{2n}}$

Find a CFG that generates this language

S -> aSbb | /\

Is this language regular? Explain why?

No it is not regular.

There are no regular expressions that can store the number of **a**s so we can measure the number of **b**s that come after.