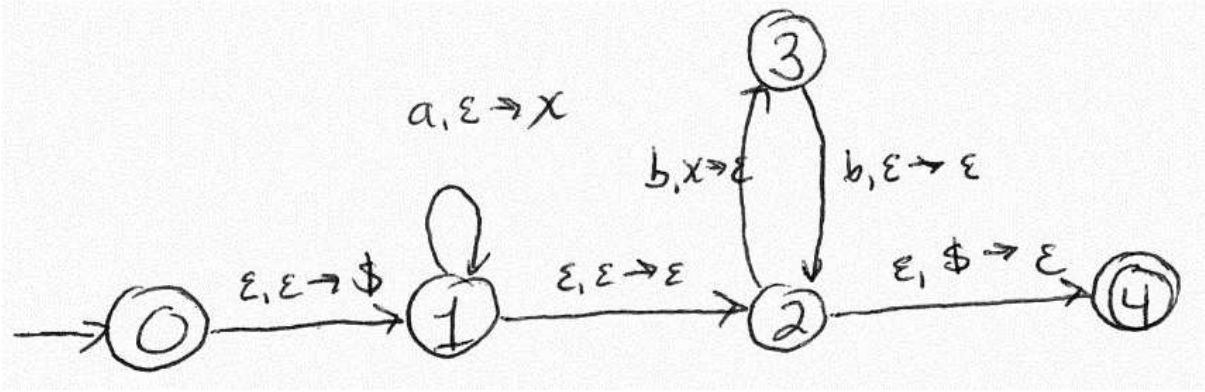
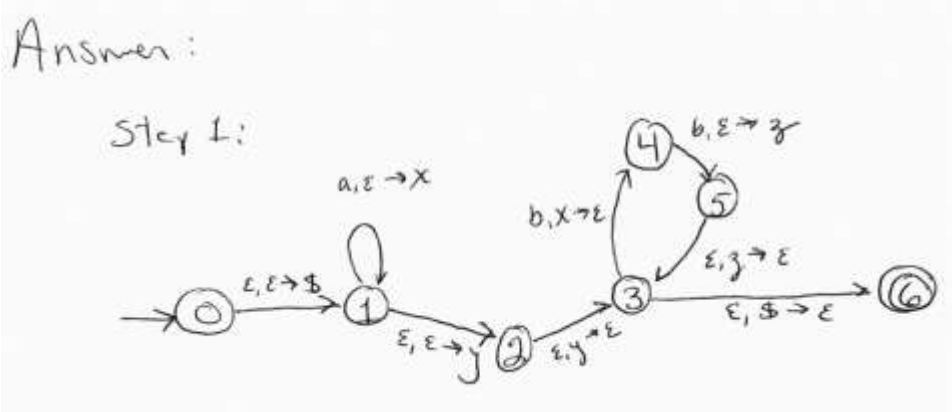
Theory of Computation, CSCI 438 spring 2022
Pushdown automaton to a context-free grammar, pages 119-123
Feb. 28

1. Using the construction described in class and given in Lemma 2.21 of the text, convert the following pda for $L=\{a^n b^{2n} \mid n \geq 0\}$ to a context-free gramm



Answer:



Step 2:

$V_{0,6} \rightarrow \varepsilon V_{1,3} \varepsilon$

$V_{1,3} \rightarrow V_{1,4} V_{4,3} \mid V_{2,2}$

$V_{1,4} \rightarrow a V_{1,3} b$

$V_{4,3} \rightarrow b V_{5,5}$

$V_{5,5} \rightarrow \varepsilon$

$V_{2,2} \rightarrow \varepsilon$

Shorten:

$V_{0,6} \rightarrow V_{1,3}$

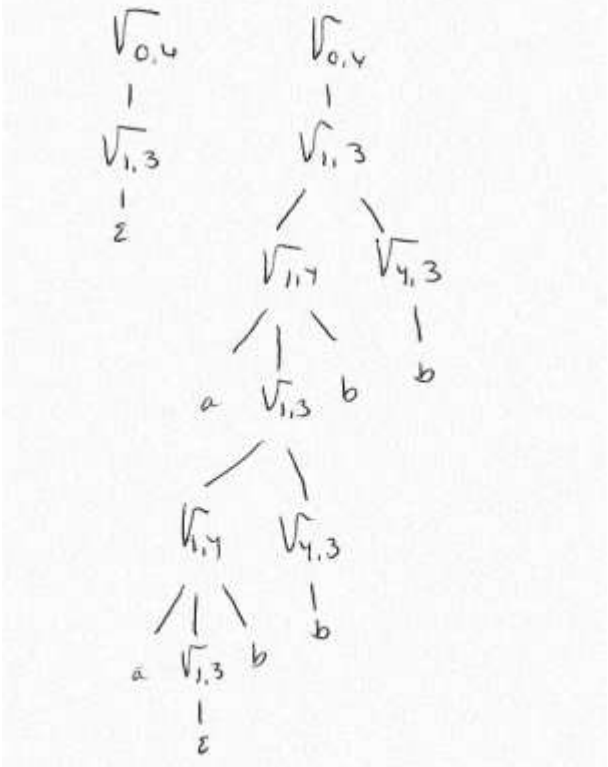
$V_{1,3} \rightarrow V_{1,4} V_{4,3} \mid \varepsilon$

$V_{1,4} \rightarrow a V_{1,3} b$

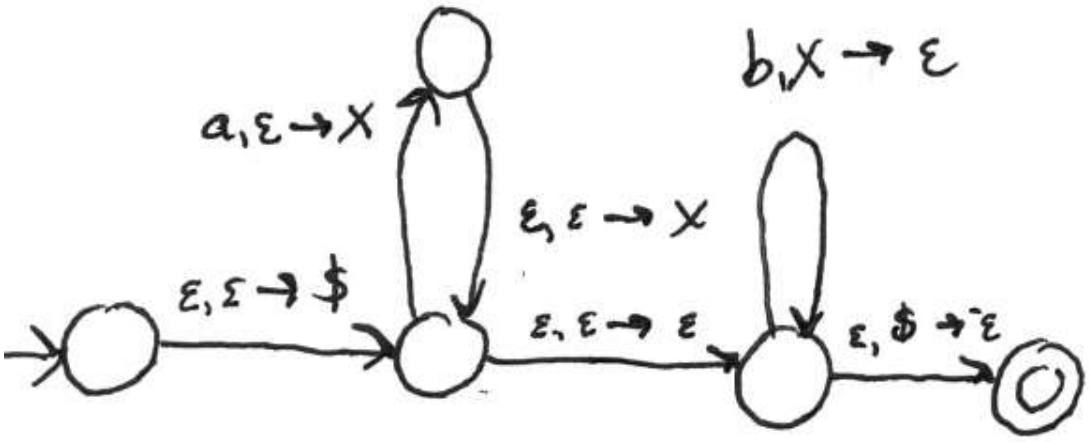
$V_{4,3} \rightarrow b$

Check:

in	out
ε	ab
abb	baa
aabbbb	

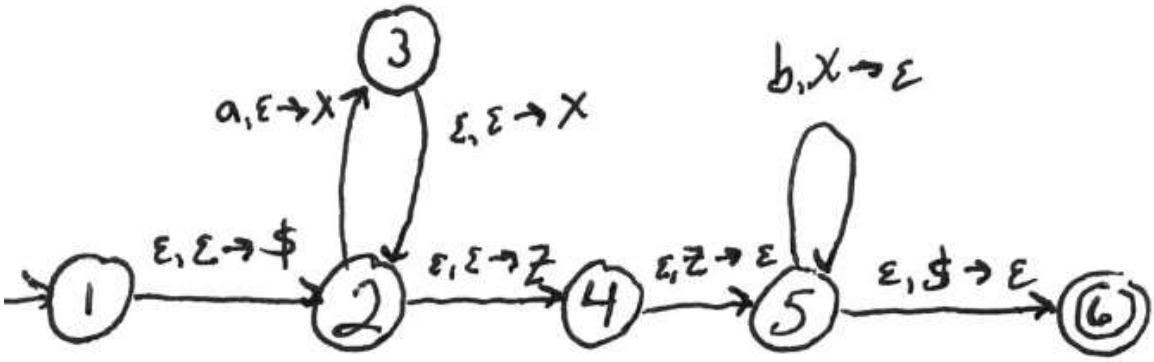


2. Using the construction described in class and given in Lemma 2.21 of the text, convert the following pda for $L=\{a^n b^{2n} \mid n \geq 0\}$ to a context-free grammar.



Answer:

Step 1:



Step 2:

$V_{1,6} \rightarrow \varepsilon\ V_{2,5}\ \varepsilon$
$V_{2,5} \rightarrow a\ V_{3,5}\ b \mid \varepsilon\ V_{4,4}\ \varepsilon$
$V_{3,5} \rightarrow \varepsilon\ V_{2,5}\ b$
$V_{4,4} \rightarrow \varepsilon$

Test: abb