Feedback — Week 4: PDA's and CFL Properties

Help Center

You submitted this homework on **Sun 18 Oct 2015 2:19 AM CEST**. You got a score of **5.00** out of **6.00**. You can attempt again, if you'd like.

Question 1

The language L = {ss | s is a string of a's and b's} is not a context-free language. In order to prove that L is not context-free we need to show that for every integer n, there is some string z in L, of length at least n, such that no matter how we break z up as $z = uvwxy$, subject to the constraints |vwx| ≤ n and |vx| > 0, there is some $i \geq 0$ such that uv^iwx^iy is not in L.

Let us focus on a particular z = aabaaaba and n = 7. It turns out that this is the wrong choice of z for n = 7, since there are some ways to break z up for which we can find the desired *i*, and for others, we cannot. Identify from the list below the choice of u,v,w,x,y for which there is an *i* that makes uv^iwx^iy not be in L. We show the breakup of aabaaaba by placing four |'s among the a's and b's. The resulting five pieces (some of which may be empty), are the five strings. For instance, aa|b||aaaba| means u=aa, v=b, w=ε, x=aaaba, and y=ε.

Your Answer		Score	Explanation
|a|abaa|a|ba			
a|ab|aaa|b|a			
a|ab|aaa|ba|			
a|ab|aa|ab|a	✖	0.00	If we pump v and x *i* times, we get the string $a(ab)^iaa(ab)^ia$. All these strings are $a(ab)^ia$ repeated.
Total		0.00 / 1.00	

Question 2

Apply the CYK algorithm to the input ababaa and the grammar:

```
S → AB | BC
A → BA | a
B → CC | b
C → AB | a
```

Compute the table of entries X_{ij} = the set of nonterminals that derive positions *i* through *j*, inclusive, of the string ababaa. Then, identify a true assertion about one of the X_{ij}'s in the list below.

Your Answer		Score	Explanation
X_{25} = {S,A,C}			
X_{16} = {B}	✔	1.00	
X_{23} = {S}			
X_{36} = {S,A,C}			
Total		1.00 / 1.00	

Question 3

Consider the pushdown automaton with the following transition rules:

1. $\delta(q,0,Z_0) = \{(q,XZ_0)\}$
2. $\delta(q,0,X) = \{(q,XX)\}$
3. $\delta(q,1,X) = \{(q,X)\}$
4. $\delta(q,\varepsilon,X) = \{(p,\varepsilon)\}$
5. $\delta(p,\varepsilon,X) = \{(p,\varepsilon)\}$
6. $\delta(p,1,X) = \{(p,XX)\}$
7. $\delta(p,1,Z_0) = \{(p,\varepsilon)\}$

The start state is *q*. For which of the following inputs can the PDA first enter state *p* with the input empty and the stack containing XXZ_0 [i.e., the ID (p,ε,XXZ_0)]?

Your Answer	Score	Explanation
001111		
0011100		
011011		

010101	✔	1.00
Total		1.00 / 1.00

Question 4

Consider the pushdown automaton with the following transition rules:

1. $\delta(q,0,Z_0) = \{(q,XZ_0)\}$
2. $\delta(q,0,X) = \{(q,XX)\}$
3. $\delta(q,1,X) = \{(q,X)\}$
4. $\delta(q,\varepsilon,X) = \{(p,\varepsilon)\}$
5. $\delta(p,\varepsilon,X) = \{(p,\varepsilon)\}$
6. $\delta(p,1,X) = \{(p,XX)\}$
7. $\delta(p,1,Z_0) = \{(p,\varepsilon)\}$

From the ID $(p,1101,XXZ_0)$, which of the following ID's can NOT be reached?

Your Answer		Score	Explanation
$(p,101,XXXXZ_0)$	✔	1.00	Notice that consuming a 1 from the input can only increase the number of X's on the stack by 1.
$(p,101,XXXZ_0)$			
$(p,01,XZ_0)$			
$(p,01,XXXXZ_0)$			
Total		1.00 / 1.00	

Question 5

Here are the transitions of a pushdown automaton. The start state is q_0, and *f* is the accepting state.

State-Symbol	a	b	ε
q_0-Z_0	(q_1,AAZ_0)	(q_2,BZ_0)	(f,ε)
q_1-A	(q_1,AAA)	(q_1,ε)	-

q_1-Z_0	-	-	(q_0,Z_0)
q_2-B	(q_3,ε)	(q_2,BB)	-
q_2-Z_0	-	-	(q_0,Z_0)
q_3-B	-	-	(q_2,ε)
q_3-Z_0	-	-	(q_1,AZ_0)

Describe informally what this PDA does. Then, identify below the one input string that the PDA accepts.

Your Answer		Score	Explanation
abbbabaab			
abbbab	✔	1.00	
bababba			
bbaabab			
Total		1.00 / 1.00	

Question 6

If we convert the context-free grammar G:

```
S → AS | A
A → 0A | 1B | 1
B → 0B | 0
```

to a pushdown automaton that accepts L(G) by empty stack, using the construction given in the slides. which of the following would be a rule of the PDA?

Your Answer		Score	Explanation
δ(q,0,A) = {(q,A)}			
δ(q,0,B) = {(q,B), (q,ε)}			
δ(q,0,0) = {(q,ε)}	✔	1.00	
δ(q,1,A) = {(q,B), (q,ε)}			
Total		1.00 / 1.00	