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Gradiance Online Accelerated Learning

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Based on Chapter 6 of HMU.

1. 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)]?

a) 0101010
b) 011011011
c) 101010
d) 0111011

Answer submitted: **b)**

You have answered the question correctly.

2. Suppose one transition rule of some PDA P is $\delta(q,0,X) = \{(p,YZ), (r,XY)\}$. If we convert PDA P to an equivalent context-free grammar G in the manner described in Section 6.3.2 (p. 247), which of the following could be a production of G derived from this transition rule? You may assume s and t are states of P, as well as p, q, and r.

a) $[qXt] \rightarrow 0[pYr][rZt]$
b) $[qXt] \rightarrow 0[pYr][qZt]$
c) $[qXt] \rightarrow 0[rXr][qYt]$

d) [qXt] → [pYr][rZt]

Answer submitted: **a)**

You have answered the question correctly.

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. $\delta(p,1,Z_0) = \{(p,\varepsilon)\}$

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

a) $(p,01,XXXZ_0)$

b) $(p,01,XXXXZ_0)$

c) $(p,101,XXZ_0)$

d) $(q,01,XXZ_0)$

Answer submitted: **d)**

You have answered the question correctly.

4. Here are the transitions of a determininstic 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.

a) abbbabaab

b) abbbabb

c) abbbab

d) bababba

Answer submitted: **c)**

You have answered the question correctly.

5. Here are the transitions of a deterministic 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 takes the PDA into state q_3 (with any stack).

a) bbaa

b) babbba

c) bababba

d) ababba

Answer submitted: **a)**

Your answer is incorrect.

Hint: notice that bba takes the PDA from state q_0 back to q_0, with only Z_0 on the stack. Pushdown automata are the subject of Section 6.1 (p. 225). See especially the informal description of how these automata move in Section 6.1.1 (p. 225) and the formal definition of their behavior in terms of instantaneous descriptions in Section 6.1.4 (p. 230).

6. If we convert the context-free grammar G:

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S → AS | A
A → 0A | 1B | 1
B → 0B | 0
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to a pushdown automaton that accepts L(G) by empty stack, using the construction of Section 6.3.1, which of the following would be a rule of the PDA?

a) $\delta(q,ε,B) = \{(q,0B), (q,0)\}$

b) $\delta(q,ε,A) = \{(q,0A)\}$

c) $\delta(q,0,B) = \{(q,B), (q,ε)\}$

d) $\delta(q,ε,A) = \{(q,A0), (q,1B), (q,1)\}$

Answer submitted: **c)**

Your answer is incorrect.

While this could be a rule if another construction were used, it does not occur when using the required construction. Recall that in the required construction, the choice of production is separated from the checking that required terminals appear on the input when needed. The construction of pushdown automata from grammars is in Section 6.3.1 (p. 243).