Formal Languages Homework 6

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1 Problem 6.1.1

Suppose the PDA $P = (\{q, p\}, \{0, 1\}, \{Z_0, X\}, \delta, q, Z_0, \{p\})$ has the following transition function

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

2 Problem 6.2.1

Design a PDA to accept each of the following languages. You may accept either by final state or by empty stack, whichever is more convenient.

2.1 a). $\{0^n 1^n \mid n \geq 1\}$

2.2 b). The set of all strings of 0's and 1's such that no prefix has more 1's than 0's.

2.3 c). The set of all strings of 0's and 1's with an equal number of 0's and 1's.

3 Problem 6.3.2

Convert the grammar to a PDA that accepts the same language by empty stack

4 Problem 6.4.1

For each of the following PDA's, tell whether or not it is deterministic. Either show that it meets the definition of a DPDA or find a rule or rules that violate it.

$$\begin{array}{rcl} S & \rightarrow & 0S1 \mid A \\ A & \rightarrow & 1A0 \mid S \mid \epsilon \end{array}$$

4.1 The PDA of Example 6.2

The PDA $P = (\{q_0, q_1, q_2\}, \{0, 1\}, \{0, 1, Z_0\}, \delta, q_0, Z_0, \{q_2\})$, where δ is defined by the following rules:
These rules are hard to read

4.2 The PDA of Exercise 6.1.1

4.3 The PDA of Exercise 6.3.3

The PDA $P = (\{q, p\}, \{0, 1\}, \{Z_0, X\}, \delta, q, Z_0)$, where δ is defined to be:

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

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5 Problem 6.4.2

Give deterministic pushdown automata to accept the following languages:

5.1 a). $\{0^n 1^m \mid n \leq m\}$

5.2 b). $\{0^n 1^m \mid n \geq m\}$

5.3 c). $\{0^n 1^m 0^n \mid n$ and m are arbitrary $\}$.