Homework #5

(1) Let M be the *PDA* defined by $Q = \{q, q_0, q_1, q_2\}$, $\Sigma = \{a,b\}$, $\Gamma = \{a\}$, $F := \{q, q_1\}$.

$\delta(q_0, a, Z_0) = \{(q, Z_0)\}$

$\delta(q, a, Z_0) = \{(q, aZ_0)\}$

$\delta(q, a, a) = \{(q, aa)\}$

$\delta(q, b, a) = \{(q_1, e)\}$

$\delta(q_1, b, a) = \{(q_1, e)\}$

$\delta(q_1, b, Z_0) = \{(q_2, e)\}$

a) Describe the language accepted by M.

b) Trace all computations of the strings ***aab, abb, aba*** in M.

c) Show that $aaabb, aaab \in L(M)$.

(2) Construct *PDA*s that accept each of the following languages.

a) $\{a^i b^j \mid 0 \le i \le j\}$

b) $\{a^i c^j b^i \mid i,j \ge 0\}$

c) $\{a^i b^j c^k \mid i+k = j\}$

d) $\{a^i b^j \mid 0 \le i \le j \le 2i\}$

(3) $L = \{w \in \{a, b\}^* \mid$ *at least one prefix of* ***w*** *contains strictly more* ***b****'s than* ***a****'s.*$\}$.

For example, ***baa, abb, abbbaa*** are in L, but ***aab, aabbab*** are not in L.

a) Construct a PDA that accepts L by final state.

b) Construct a PDA that accepts L by empty stack.

(4) From the main text ***Exercises 6.3.4, 7.1.3, 7.2.1(b,c)***