HW 317 - HW #9

1. $Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6\}$

$\Sigma = \{a, b\}$

$\Gamma = \{A, B\}$

$\delta =$ $(q0, a, Z0) \rightarrow (q_1, AZ0)$

$(q1, a, A) \rightarrow (q_1, AA)$

$(q1, b, A) \rightarrow (q_2, bA)$

$(q^2, a, B) \rightarrow (q2, Ba)$

$(q_2, b, B) \rightarrow (q^3, bB)$

$(q3, a, A) \rightarrow (q4, aA)$

$(q3, b, A) \rightarrow (q3, bA)$

$(q4, a, B) \rightarrow (q4, Ba)$

$(q4, b, B) \rightarrow (q5, Bb)$

$(q5, a, A) \rightarrow (q5, aA)$

$(q5, b, A) \rightarrow (q6, bbA)$

$(q6, a, B) \rightarrow (q6, aB)$

$(q6, b, B) \rightarrow (q6, bB)$

$(q0, b, z0) \rightarrow (q2, bz0)$

If the string is being derived using $S \rightarrow AB$, then the PDA will need to be in state $q3$ and will need to read an A followed by a B. This will transition the PDA to state $q4$.

3. Let L_1 and L_2 be two regular languages. Show that $L_3 = \{xx^r : x \in L_1 \text{ and } x^r \in L_2\}$ is a context free language.

$L_1 = \{a^n b^n \mid n \geq 0\}$

$f: \{a, b\} \Rightarrow \Sigma \quad f: \{a, b\} \Rightarrow \Sigma$

$L_2 = f(L_1) = \{U \$ V \mid U, V \in \Sigma^*, |U| = |V|\}$

$L_3 = L_1 \cap L_2$

$h: \Sigma \cup \{\$\} \Rightarrow \Sigma^*$ as follow. $h(\sigma) = \sigma, h(\$) = \epsilon$

$h(L_4) = \{ab \mid a \in x, b \in x^r,\}$

L_3 is a context free language.

4. Show that $L = \{a^{2M} b^{3M} c^{4M} : M \geq 0\}$ is not context free language.

L is CFL

$w = aa\ bb\ cccc$

$w = \underbrace{aa}_{u}\ \underbrace{bb}_{v}\ \underbrace{bc}_{x}\ \underbrace{cc}_{y}\ \underbrace{c}_{z}$

$w = uv^i xy^i z$

if $i = 2$

$= aa\ bbbbbc\ ccccc$

$w \notin L$

Given language L is not CFL