Cpt S 317 Homework #9

Please print your name!

1. Given a grammar G
   $S \rightarrow aaB|bbA|AB|aabb$
   $A \rightarrow BA|aB|a$
   $B \rightarrow AB|bA|b$.
Construct a PDA accepting $L(G)$.

2. Recall that the following PDA M accepting language $L = \{w \in \{0,1\}^* : w = w^r\}$:

$$M = \langle Q, \Sigma, \Gamma, \delta, q_0, Z_0, A \rangle$$

where $Q = \{q_0, q_{even}, q_{odd}, q_2\}$, $\Sigma = \{0,1\}$, $\Gamma = \{0,1,Z_0\}$, $A = \{q_2\}$. Moves are:

   $\delta(q_0, *_1, *_2) = \{(q_0, *_1 *_2)\}$ with $*_1 = 0,1, *_2 = 0,1$,
   $\delta(q_0, \Lambda, 1) = \{(q_{even}, 1), (q_{odd}, 1)\}$
   $\delta(q_0, \Lambda, 0) = \{(q_{even}, 0), (q_{odd}, 0)\}$
   $\delta(q_{odd}, *_1, *_2) = \{(q_{even}, *_2)\}$ with $*_1 = 0,1, *_2 = 0,1$
   $\delta(q_{even}, 1, 1) = \{(q_{even}, \Lambda)\}$
   $\delta(q_{even}, 0, 0) = \{(q_{even}, \Lambda)\}$
   $\delta(q_{even}, \Lambda, Z_0) = \{(q_2, \Lambda)\}$ (empty-stack acceptance)
   $\delta(q_0, \Lambda, Z_0) = \{(q_2, \Lambda)\}$ (make sure that Λ is accepted)

Translate M into a grammar G.

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

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