CS 580 Homework 6

October 2nd(Monday) 11:59 AM, 2023

For all requested PDAs, please give the full seven-tuple.

1. Produce a PDA that accepts $\{a^i b^{i+j} c^j | i + j \geq 1\}$ by final state
2. Produce a PDA that accepts $\{a^i b^j c^k | i = j \text{ or } j = k\}$ by empty stack
3. Add comments to the code shown below. What is N(M) for this PDA?

   $M = \langle \{q_0, q_1, q_2\}, \{a, b\}, \{A, z_0\}, \delta, q_0, z_0, \emptyset \rangle$

   $\delta(q_0, a, z_0) = (q_0, Az_0)$

   $\delta(q_0, a, A) = (q_0, AA)$

   $\delta(q_0, b, A) = (q_2, \lambda)$

   $\delta(q_2, \lambda, A) = (q_1, \lambda)$

   $\delta(q_1, b, A) = (q_2, \lambda)$

   $\delta(q_1, \lambda, z_0) = (q_1, \lambda)$

4. Use the pumping lemma to show that each language defined below is not context-free.

   a. $L = \{s | s \in (a+b+c)^*, s \text{ contains equal numbers of } a's, b's, \text{ and } c's\}$

   b. $L = \{a^{2^j} | j \geq 1\}$

   c. $L = \{ww | w \in (a + b)^*\}$

   d. $L = \{a^j b^{jk} c^k | j, k \geq 1\}$