

CS 5800 Assignment 6 / Spring 2021

Due: March 24, 2020

Name: _____

1. Construct a PDA that accepts the language derived by the grammar with production rules

$$S \rightarrow aABC \mid a$$

$$A \rightarrow aA \mid a$$

$$B \rightarrow bD$$

$$D \rightarrow cB \mid c$$

$$C \rightarrow cC \mid c$$

2. Construct a PDA that accepts the parentheses language L consisting of all well-formed strings with two kinds of bracket symbols, defined as follows:

- $() \in L, [] \in L$
- If $u \in L$, then $(u) \in L$ and $[u] \in L$
- If $u \in L$ and $v \in L$, then $uv \in L$

3. Are the following languages context-free or not context-free: Prove your answer.

(i) $L = \{a^i b^{2i} c^i \mid i \geq 0\}$

(ii) $L = \{a^i b^j c^i d^j \mid i, j \geq 0, i \geq j\}$

4. Construct a TM that accepts the language $\{w \in \{a, b\}^* \mid w = w^R\}$.
5. Construct a TM that, for input string u (in unary notation), writes the string $2^{|u|}$.
6. Show that the following set is TM enumerable: $\{n \in \mathbb{N} \mid n \text{ is a perfect square}\}$.