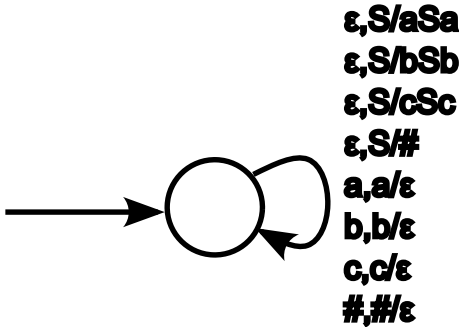
COMPSCI 3331 - Fall 2022 - Quiz 7

Name									
Student Number									

(2 marks) 1. Construct a PDA for the language $L = \{w\#w^R \ : \ w \in \{a,b,c\}^*\}$. For example, $ac\#ca, acbb\#bbca \in L$. Your PDA must accept by empty stack and have only one state. Be sure to indicate the start stack symbol for your PDA in your answer.

Solution: Use the grammar below and convert it to a PDA using the conversion algorithm.

$$
\begin{aligned}
S &\rightarrow aSa \\
S &\rightarrow aSa \\
S &\rightarrow aSa \\
S &\rightarrow \#
\end{aligned}
$$



In this PDA, the initial stack symbol is S.

(2 marks) 2. Let $L = \{a^r b^s c^t \ : \ r,s,t \geq 0 \text{ and } r < s < t\}$. The language L is not context-free. Let $z = a^n b^{n+1} c^{n+2}$. **List all** of the possible cases for decomposing this word z when using the context-free pumping lemma. **Do not prove, or make any conclusions for, any of the cases.** You are only responsible for **listing** all of the possible decompositions of z that would have to be considered.

If the decomposition is labelled as $z = uvwxy$, then the cases are:

- *v or $x \notin a^* + b^* + c^*$: one of v and x consists of more than one letter.*
- *$v,x \in a^*$: both of v and x are in the block of a's.*
- *$v \in a^*, x \in b^*$: v is in the block of a's, while x is in the block of b's.*
- *$v,x \in b^*$: both of v and x are in the first block of a's.*
- *$v \in b^*, x \in c^*$: v is in the block of b's, while x is in the block of c's.*
- *$v,x \in c^*$: both of v and x are in the block of c's.*