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HW5

1.) Give an English description of the language recognized by the following the PDA's state diagram:

Push the symbols onto the stack. If its always the same symbol (ε) then accept, otherwise reject. If in q_2 and q_3, the symbol is different, then pop off the corresponding symbol, either ##, ###, ε.

2.) Give a context free grammar that generates the lang.:
$A = \{a^i b^j c^k \mid i = j \text{ or } j = k \text{ where } i, j, k \geq 0\}$

$V = \{S, A\}$
$\Sigma = \{a, b, c\}$
S = start variable
$R =$

$S \rightarrow AB$
$A \rightarrow aAb$
$B \rightarrow BcC$

The grammar is ambiguous because $i = j$ and $j = k$, which means that $i = k$. This means the same string prints out every time / same number of a's, b's, and c's

3.) Give an informal description ....
A string will print out with the same number of a's, b's, and c's.

4.) Use the lang. A and B together with Exercise 2.36 to show the class of context-free lang. is not closed under intersection.

$A = \{a^m b^n c^n \mid m, n \geq 0\}$ $B = \{a^n b^n c^m \mid m, n \geq 0\}$

A:

$S \rightarrow AB$

$A \rightarrow aA$ ⟷ opposites of each other

$B \rightarrow bBc$

B:

$S \rightarrow aABb \mid \epsilon$

$A \rightarrow aAb \mid \epsilon$

$B \rightarrow cB$

$A \cap B = \{a^n b^n c^n \mid n \geq 0\}$, which in the book says is not a CFL (pg. 128). Both have the same # of alphabet symbols, but not the same order. A and B don't have the same order.

5.) $L = \{b^{m!} \mid m \geq 0, \ m \in Z\}$

Is $L \in CFL$? If yes, provide either a PDA or a context-free grammar. If no, prove the lang. is not context free

Let $s = bbbb$

$s = xyz$

$x = b$

$y = bb$

$z = bb$

$xy^2z = b(bb)^2bb$

$= bbbbbbb$

$m = 7$

This means that L is $\notin$ CFL because 7 is not equal to 4, the original string length.