COMP 335 Assignment 6

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Question 1.

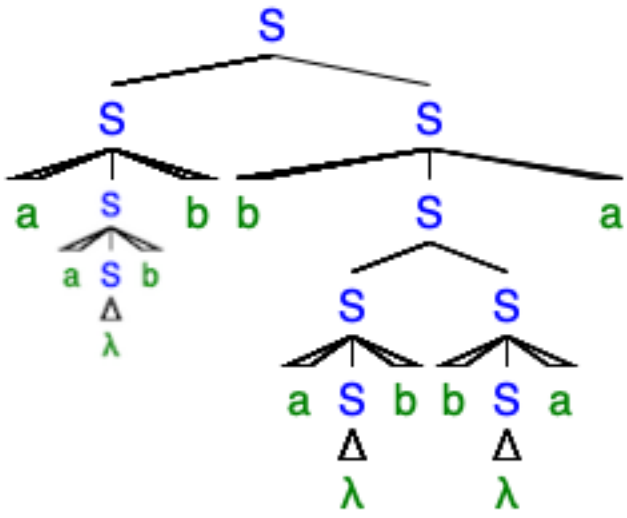
(a) G_1 = (V, T, S, P) such that V is a set of variables $\{S, X\}$, where S is the start variable and T is the set of terminals {0,1}.
S $\rightarrow$ XY
X $\rightarrow$ 0X0 | 1X1 | Y
Y $\rightarrow$ ZZ
Z $\rightarrow$ 0|1

(b) G_2 = (V, T, S, P) such that V is a set of variables $\{S, X\}$, where S is the start variable and T is the set of terminals {a,b,c,d}.
S $\rightarrow$ aSc | aSd | X
X $\rightarrow$ bXc | bXd | λ

(c) G_3 = (V, T, S, P) such that V is a set of variables $\{S, X, Y\}$, where S is the start variable and T is the set of terminals {a,b}.
S $\rightarrow$ YXYaaYXY
X $\rightarrow$ XaXbX | XbXaX | λ
Y $\rightarrow$ aY | λ

Question 2.

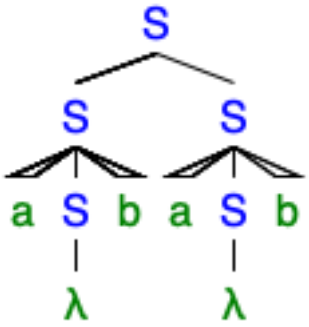
(a)



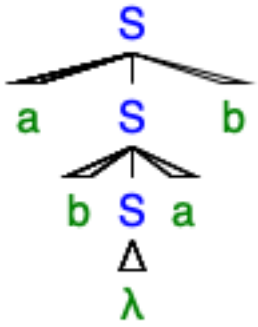
(b) $S \Rightarrow SS$
$\Rightarrow aSbS$
$\Rightarrow aaSbbS$
$\Rightarrow aabbS$
$\Rightarrow aabbbSa$
$\Rightarrow aabbbSSa$
$\Rightarrow aabbbaSbSa$
$\Rightarrow aabbbabSa$
$\Rightarrow aabbbabbSaa$
$\Rightarrow aabbbabbaa$

(c) Yes, the grammar G is ambiguous.
Explanation: a CFG is said to be ambiguous iff there exists a string in T that has more than one parse tree representation.

Lets take string *abab* for instance. The string exists in grammar G it can be represented as the two parse trees as seen below (Tree 1 and Tree 2). Therefore, the grammar G is ambiguous.



Tree 1



Tree 2