Student Information

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Answer 1

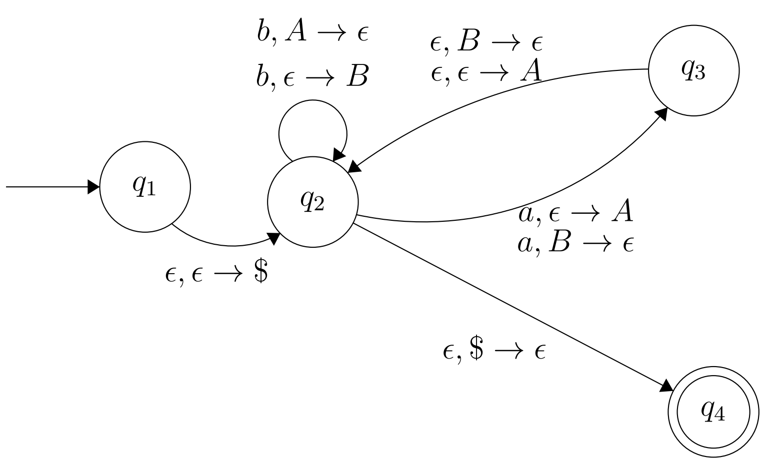
a) G=(V, Σ, R, S) with set of variables V=S, where S is start variable; set of terminals $\Sigma = \{a, b\}$; and rules:

S →bSbSa| aSbSb | bSaSb | SS | ϵ

b) G=(V, Σ, R, S) with set of variables V=S, where S is start variable; set of terminals $\Sigma = \{a, b\}$; and rules:

S → $aaSb|aSb|\epsilon$

c) The corresponding Pushdown automata M = $(\{q_1, q_2, q_3, q_4\}, \{a, b\}, \{A, B, \$\}, \Delta, q_1, Z, \{q_4\})$ where:



d) Let context-free grammar for L_1 is G_1, likewise let G_2 to be a context-free grammar for L_2 Then:
$G_1 = (V_1, \Sigma_1, R_1, S_1)$
$G_2 = (V_2, \Sigma_2, R_2, S_2)$
Let S be a new symbol and let G= $(V_1 \cup V_2 \cup \{S\}, \Sigma_1 \cup \Sigma_2, R, S)$ where:
R=$(R_1 \cup R_2 \cup \{S \to S_1, S \to S_2\})$ Then;
we can claim that $L(G) = L(G_1) \cup L(G_2)$

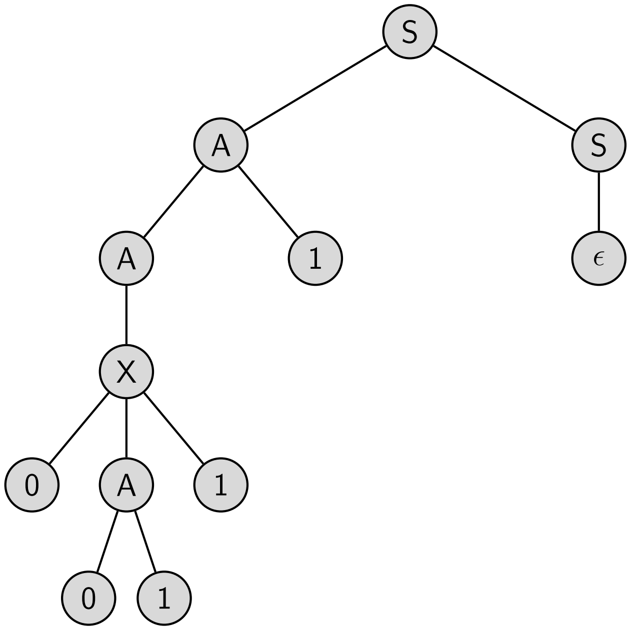
G= $(\{S_1, S_2, S\}, \{a, b\}, R, S)$ where;
R= $\{S \rightarrow S_1|S_2, S_1 \rightarrow bSbSa|aSbSb|bSaSb|SS|\epsilon, S_2 \rightarrow aaSb|aSb|\epsilon\}$

Answer 2

a) A context-free grammar G is ambiguous if ∃ a string w ∈ L(G) to have at least two different left parse trees.
Let try string w="0001111" to reach two different parse trees:
The First Parse tree;
$S \rightarrow AS$
$\rightarrow A1S$
$\rightarrow 0A11S$
$\rightarrow 00A111S$
$\rightarrow 0001111S$
$\rightarrow 0001111$ and
The Second Parse Tree;
$S \rightarrow AS$
$\rightarrow 0A1S$
$\rightarrow 00A11S$
$\rightarrow 00A111S$
$\rightarrow 0001111S$
$\rightarrow 0001111$
Hence;
We find a two different parse trees for a same string "0001111" we can conclude that this grammar is ambiguous.

b) G1 $=(V, \Sigma, R, S)$, where;
V = $\{0, 1, S, A, X\}$, $\Sigma = \{0, 1\}$, and the rules are:
R= $\{S \rightarrow AS|\epsilon, A \rightarrow 01|X, X \rightarrow 01|0A1\}$
disambiguate the G_1

c) Leftmost derivation of string w="00111" is:
$S \rightarrow AS$
$\rightarrow A1S$
$\rightarrow X1S$
$\rightarrow 0A11S$
$\rightarrow 00111S$
$\rightarrow 00111$ and the corresponding parse tree;


S
A
S
A
1
ϵ
X
0
A
1
0
1