HW2

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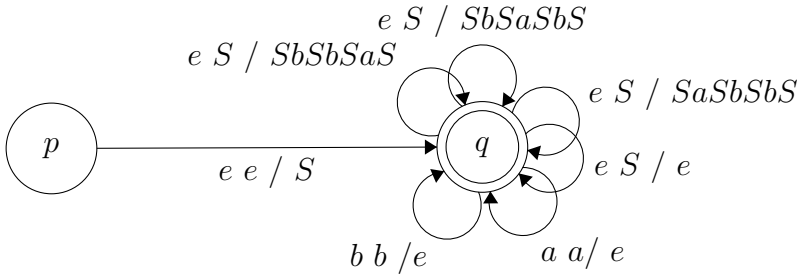
1

1.1 $L_1 = \{\ V_1,\ \Sigma_1,\ R_1,\ S_1,\ \}$
$V_1 = \{\ S, a, b\ \}$
$\Sigma_1 = \{a, b\}$
$R_1 = \{S \to SbSbSaS|SbSaSbS|SaSbSbS|e\}$
$S_1 = \{\ S\ \}$

1.2 $L_2 = \{\ V_2,\ \Sigma_2,\ R_2,\ S_2,\ \}$
$V_2 = \{\ T, a, b\ \}$
$\Sigma_2 = \{a, b\}$
$R_2 = \{T \to aTb|aaTb|e\}$
$S_2 = \{\ T\ \}$

1.3 $M = \{\ K, \Sigma, \Gamma, \Delta, s, F\ \}$
$K = \{\ p, q\ \}$
$\Sigma = \{S, a, b\}$
$\Gamma = \{S, a, b\}$
$\Delta = \{\ (p, e, e)(q, S),$
$(p, e, S)(q, SbSbSaS),$
$(q, e, S)(q, SbSaSbS),$
$(q, e, S)(q, SaSbSbS),$
$(q, e, S)(q, e),$
$(q, e, a)(q, e),$
$(q, e, b)(q, e)\ \}$
$s = \{\ p\ \}$
$F = \{\ q\ \}$

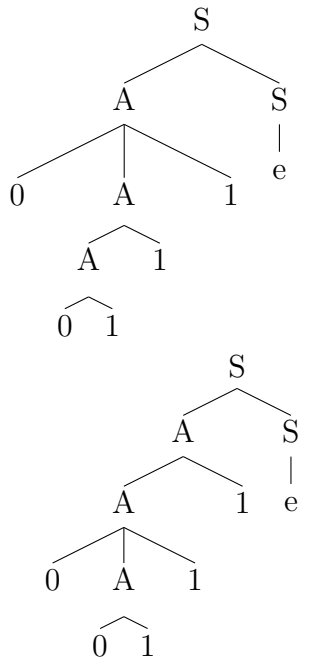


1.4 **L_1 and L_2 are both context free grammars, with disjoint sets of non terminals. Let K be a new symbol and**
$L_3 = \{(V_1 \cup V_2 \cup K), (\Sigma_1 \cup \Sigma_2), (R_1 \cup R_2 \cup (K \to S, K \to T)), K\}$

$V_3 = \{\ K, S, T, a, b\ \}$
$\Sigma_3 = \{a, b\}$
$R_3 = \{K \to S|T\ ,\ T \to aTb|aaTb|e,\ S \to SbSbSaS|SbSaSbS|SaSbSbS|e\}$
$S_3 = \{\ K\ \}$

2

2.1 If a word w has more than one parse tree that represents it then language is ambiguous. And as showed below we can draw 2 different parse trees for word "00111" with given CFL.



2.2 $\{S \to AS|e,\ A \to 0C1,\ C \to 0C1 \mid B\ ,B \to B1 \mid e\}$

2.3 $S \to AS,\ A \to 0C1,\ C \to 0C1,\ C \to B,\ B \to B1,\ B \to e,\ S \to e$