

CENG280 Homework 2

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Answer 1

Let G_1 be the quadruple (V, Σ, R, S) where

$$V = \{a, b, S\},$$

$$\Sigma = \{a, b\},$$

$$R = \{S \rightarrow e \mid SS \\ \mid abbS \mid abSb \mid aSbb \mid Sabb \\ \mid babS \mid baSb \mid bSab \mid Sbab \\ \mid bbaS \mid bbSa \mid bSba \mid Sbba\}$$

Answer 2

Let G_2 be the quadruple (V, Σ, R, S) where

$$V = \{a, b, S\},$$

$$\Sigma = \{a, b\},$$

$$R = \{S \rightarrow e \mid aSb \mid aaSb\}$$

Answer 3

Let M_1 be the sextuple $(K, \Sigma, \Gamma, \Delta, s, F)$ where

$$K = \{s, f\}$$

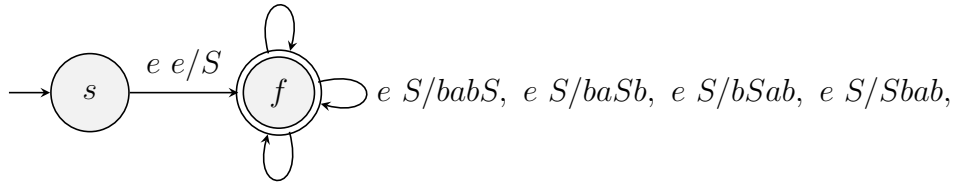
$$\Sigma = \{a, b\}$$

$$\Gamma = \{a, b, S\}$$

$$F = \{f\}$$

$$\Delta = \{((s, e, e), (f, S)), \\ ((f, e, S), (f, e)), ((f, e, S), (f, SS)), \\ ((f, e, S), (f, abbS)), ((f, e, S), (f, abSb)), \\ ((f, e, S), (f, aSbb)), ((f, e, S), (f, Sabb)), \\ ((f, e, S), (f, babS)), ((f, e, S), (f, baSb)), \\ ((f, e, S), (f, bSab)), ((f, e, S), (f, Sbab)), \\ ((f, e, S), (f, bbaS)), ((f, e, S), (f, bbSa)), \\ ((f, e, S), (f, bSba)), ((f, e, S), (f, Sbba)), \\ ((f, a, a), (f, e)), ((f, b, b), (f, e))\}$$

$e S/e, e S/SS, e S/abbS, e S/abSb, e S/aSbb, e S/Sabb$



$e S/bbaS, e S/bbSa, e S/bSba, e S/Sbba, a a/e, b b/e$

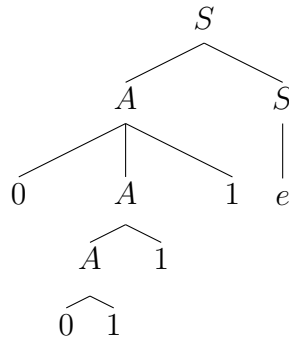
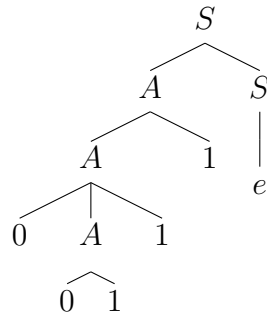
Answer 4

Let G_3 be the quadruple (V, Σ, R, S) where

$$\begin{aligned}
 V &= \{a, b, S\}, \\
 \Sigma &= \{a, b\}, \\
 R &= \{S \rightarrow S_1 \mid S_2, \\
 &\quad S_1 \rightarrow e \mid S_1 S_1 \\
 &\quad \quad \mid abbS_1 \mid abS_1b \mid aS_1bb \mid S_1abb \\
 &\quad \quad \mid babS_1 \mid baS_1b \mid bS_1ab \mid S_1bab \\
 &\quad \quad \mid bbaS_1 \mid bbS_1a \mid bS_1ba \mid S_1bba, \\
 &\quad S_2 \rightarrow e \mid aS_2b \mid aS_2bb\}
 \end{aligned}$$

Answer 5

The string 00111 can be parsed in two different ways, showing that G_1 is ambiguous.



Answer 6

Let G_b be the quadruple (V, Σ, R, S) where

$$\begin{aligned} V &= \{0, 1, S, A, B\}, \\ \Sigma &= \{0, 1\}, \\ R &= \{S \rightarrow AS \mid e, \\ &\quad A \rightarrow 0A1 \mid 0B, \\ &\quad B \rightarrow B1 \mid 1\} \end{aligned}$$

Answer 7

$$\begin{aligned} S &\xRightarrow{L} AS \\ &\xRightarrow{L} 0A1S \\ &\xRightarrow{L} 00B1S \\ &\xRightarrow{L} 00B11S \\ &\xRightarrow{L} 00111S \\ &\xRightarrow{L} 00111 \end{aligned}$$

