

Student Information

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Q1

a.

$$L_1 = (V_1, \Sigma_1, R_1, S_1),$$

$$V_1 = \{a, b, S_1\}$$

$$\Sigma_1 = \{a, b\}$$

$$R_1 = \{(S_1, aS_1bS_1b), (S_1, bS_1aS_1b), (S_1, bS_1bS_1a), (S_1, S_1S_1), (S_1, e)\}$$

b.

$$L_2 = (V_2, \Sigma_2, R_2, S_2),$$

$$V_2 = \{a, b, S_2\}$$

$$\Sigma_2 = \{a, b\}$$

$$R_2 = \{(S_2, aS_2bA), (S_2, e), (A, b), (A, e)\}$$

c.

$$M = (K, \Sigma, \Gamma, \Delta, p, F),$$

$$K = \{q, p\}$$

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

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

$$F = \{q\}$$

$$\Delta = \{((p, e, e), (q, S)), ((q, e, S), (q, aSbSb)), ((q, e, S), (q, bSaSb)), \\ ((q, e, S), (q, bSbSa)), ((q, e, S), (q, SS)), ((q, e, S), (q, e)), \\ ((q, a, a), (q, e)), ((q, b, b), (q, e))\}$$

d.

$$L_3 = (V, \Sigma, R, S),$$

$$V = V_1 \cup V_2 \cup S = \{a, b, S_1, S_2, S\}$$

$$\Sigma = \Sigma_1 \cup \Sigma_2 = \{a, b\}$$

$$R = R_1 \cup R_2 \cup \{(S, S_1), (S, S_2)\} = \{(S_1, aS_1bS_1b), (S_1, bS_1aS_1b), (S_1, bS_1bS_1a), \\ (S_1, S_1S_1), (S_1, e), (S_2, aS_2bA), (S_2, e), (A, b), (A, e), (S, S_1), (S, S_2)\}$$

Q2

a.

Since there are two leftmost derivations for string 00111, G_1 is ambiguous.

$$S \Rightarrow AS \Rightarrow 0A1S \Rightarrow 0A11S \Rightarrow 00111S \Rightarrow 00111$$

$$S \Rightarrow AS \Rightarrow A1S \Rightarrow 0A11S \Rightarrow 00111S \Rightarrow 00111$$

b.

$$V = \{0, 1, S, A, B\}$$

$$\Sigma = \{0, 1\}$$

$$R = \{(S, AS), (S, e), (A, 0AB1), (A, 01), (B, B1), (B, e)\}$$

c.

$$S \Rightarrow AS \Rightarrow 0AB1S \Rightarrow 001B1S \Rightarrow 001B11S \Rightarrow 00111S \Rightarrow 00111$$

