Expressões regulares:

As gramáticas $G_1 = (V_1, \Sigma, P_1, S_1)$ e $G_2 = (V_2, \Sigma, P_2, S_2)$, relativas a cada uma das linguagens listadas a seguir, foram obtidas a partir do DFA e do NFA, respectivamente, propostos nos gabaritos das atividades AA-4 e AA-6 ($S \equiv s_0, A \equiv s_1, B \equiv s_2, C \equiv s_3, \ldots$).

 $\mathcal{L}_1 = \{w \in \Sigma^* = \{0,1\}^* \mid |w| \geqslant 4 \text{ e o segundo e o penúltimo símbolos de } w \text{ são, ambos, } 1\}.$

• $G_1 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0A \mid 1A, & C \rightarrow 0D \mid 1E, \\ A \rightarrow 1B, & D \rightarrow 0B \mid 1C \mid \varepsilon, \\ B \rightarrow 0B \mid 1C, & E \rightarrow 0D \mid 1E \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1A, \\ A \to 1B, \\ B \to 0B \mid 1B \mid 1C, \end{array} \right| \begin{array}{l} C \to 0D \mid 1D, \\ D \to \varepsilon \end{array} \right\}.$$

 $\mathcal{L}_2 = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w| \text{ \'e par e } w \text{ cont\'em pelo menos um s\'embolo } 0 \}.$

• $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0B \mid 1A, \parallel B \rightarrow 0C \mid 1C, \\ A \rightarrow 0C \mid 1S, \parallel C \rightarrow 0B \mid 1B \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0A \mid 1B \mid 1C, & C \rightarrow 0D, \\ A \rightarrow 0D \mid 1D, & D \rightarrow 0E \mid 1E \mid \varepsilon \\ B \rightarrow 1S, & E \rightarrow 0D \mid 1D \end{array} \right\}.$$

 $\mathcal{L}_3 = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ não termina com a subcadeia } 0011 \}.$

• $G_1 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0A \mid 1S \mid \varepsilon, \\ A \rightarrow 0B \mid 1S \mid \varepsilon, \\ B \rightarrow 0B \mid 1C \mid \varepsilon, \end{array} \right. \left. \begin{array}{l} C \rightarrow 0A \mid 1D \mid \varepsilon, \\ D \rightarrow 0A \mid 1S \end{array} \right\}.$$

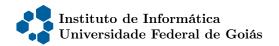
• $G_2 = (\{A, B, C, D, E, F, G, H, I, J, K, L, M, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0A \mid 1H \mid H, \\ A \rightarrow 0B \mid 0E \mid 1H, \\ B \rightarrow 0B \mid 1C, \\ C \rightarrow 0A \mid 1D, \end{array} \right. \left. \begin{array}{l} D \rightarrow 0A, \\ E \rightarrow 0E \mid 1F, \\ F \rightarrow 1G, \\ G \rightarrow 1H, \end{array} \right. \left. \begin{array}{l} H \rightarrow 0I \mid S \mid \varepsilon, \\ I \rightarrow 0J \mid \varepsilon, \\ J \rightarrow 0J \mid 1K \mid 1M \mid \varepsilon, \end{array} \right. \left. \begin{array}{l} K \rightarrow 0I \mid 1L, \\ L \rightarrow 0I \\ M \rightarrow \varepsilon \end{array} \right\}.$$

 $\mathcal{L}_4 = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ termina com } 101 \text{ e contém } 100 \}.$

• $G_1 = (\{A, B, C, D, E, F, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0S \mid 1A, \\ A \rightarrow 0B \mid 1A, \\ B \rightarrow 0C \mid 1A, \end{array} \right| \left. \begin{array}{l} C \rightarrow 0C \mid 1D, \\ D \rightarrow 0E \mid 1D, \\ \end{array} \right| \left. \begin{array}{l} E \rightarrow 0C \mid 1F, \\ F \rightarrow 0E \mid 1D \mid \varepsilon \end{array} \right\}.$$



• $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0S \mid 1S \mid 1A, \\ A \to 0B, \\ B \to 0C, \end{array} \right. \left. \left. \begin{array}{l} C \to 0C \mid 1C \mid 1D, \\ D \to 0E, \end{array} \right. \left. \left. \begin{array}{l} E \to 1F, \\ F \to \varepsilon \end{array} \right. \right\}.$$

 $\mathcal{L}_5 = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w| \neq 2 \}.$

 $\mathcal{L}_6 = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ não começa com } 000 \text{ e não termina com } 111 \}.$

 $\mathcal{L}_7 = \{w \in \Sigma^* = \{0,1\}^* \mid |w| > 0 \text{ e o primeiro e o penúltimo símbolos de w são idênticos}\}.$

 $\mathcal{L}_8 = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w| \text{ \'e impar e } w \text{ começa com } 0 \text{ e termina com } 1 \}.$

• $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0B \mid 1B, \\ \end{array} \right. \left. \left. \left. \left. \left. \left| \begin{array}{l} B \to 0A \mid 1C, \\ C \to 0B \mid 1B \mid \varepsilon \end{array} \right. \right. \right\}.$$

• $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0B \mid 1B, \\ B \to 0C \mid 1C \mid 1D, \end{array} \right. \left. \begin{array}{l} C \to 0B \mid 1B, \\ D \to \varepsilon \end{array} \right\}.$$

 $\mathcal{L}_9 = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ contém no máximo 4 ocorrências do símbolo 0} \}.$

• $G_1 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0A \mid 1S \mid \varepsilon, \\ A \rightarrow 0B \mid 1A \mid \varepsilon, \\ B \rightarrow 0C \mid 1B \mid \varepsilon, \end{array} \right. \left. \begin{array}{l} C \rightarrow 0D \mid 1C \mid \varepsilon, \\ D \rightarrow 1D \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow A \mid B \mid C \mid D \mid \varepsilon, \\ A \rightarrow 0E, \\ B \rightarrow 0F, \\ C \rightarrow 0G, \end{array} \right. \left. \begin{array}{l} D \rightarrow 0H, \\ E \rightarrow O, \\ F \rightarrow 0I \mid 1F, \\ G \rightarrow 0J \mid 1G, \end{array} \right. \left. \begin{array}{l} H \rightarrow 0K \mid 1H, \\ I \rightarrow O, \\ J \rightarrow 0L \mid 1J, \\ K \rightarrow 0M \mid 1K, \end{array} \right. \left. \begin{array}{l} D \rightarrow 0N \mid 1M, \\ N \rightarrow O, \\ N \rightarrow O, \\ O \rightarrow 1O \mid \varepsilon \end{array} \right\}.$$

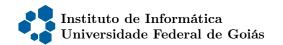
 $\mathcal{L}_{10} = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ começa com } 0 \text{ e contém quantidade ímpar de 1's} \}.$

• $G_1 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to 0B \mid 1A \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to C, \end{array} \right. \left. \left. \begin{array}{l} C \to 0C \mid 1D \mid \varepsilon, \\ D \to 0D \mid 1C \end{array} \right. \right\}.$$



 $\mathcal{L}_{11} = \{ w \in \Sigma^* = \{0, 1\}^* \mid \text{ todo símbolo } 0 \text{ em } w \text{ é seguido de pelo menos dois 1's consecutivos, exceto a última ocorrência de 0 em } w \}.$

 $\mathcal{L}_{12} = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ começa com } 0, \text{ não contém } 10 \text{ e termina com } 1 \}.$

• $G_1 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to 1B \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0S \mid 0A, \\ A \to 1A \mid 1B, \\ B \to \varepsilon \end{array} \right\}.$$

 $\mathcal{L}_{13} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w = xyz \in |x| = 2 \}.$

 $\mathcal{L}_{14} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w| \text{ \'e impar e } w \text{ termina com } 1 \}.$

• $G_1 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B, \\ A \to 0S \mid 1S, \\ B \to 0S \mid 1S \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1A \mid B, & B \to 1C, \\ A \to 0S \mid 1S, & C \to \varepsilon \end{array} \right\}.$$

 $\mathcal{L}_{15} = \{w \in \Sigma^* = \{0,1\}^* \mid |w| \text{ contém quantidade par de 0's ou ímpar de 1's (ou ambos)}\}.$

 $\mathcal{L}_{16} = \{w \in \Sigma^* = \{0,1\}^* \mid |w| \text{ termina com um } 0 \text{ seguido de uma quantidade ímpar de 1's}\}.$

 $\mathcal{L}_{17} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w|_0 \text{ \'e par e todos os 0's antecedem todos os 1's} \}.$

• $G_1 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$

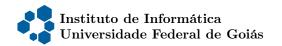
$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B \mid \varepsilon, \\ A \to 0S, \\ B \to 1B \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to A \mid C, \\ A \to 0B \mid 1C \mid \varepsilon, \end{array} \right. \left. \left. \left. \left. \right| \begin{array}{l} B \to 0A, \\ C \to 1C \mid \varepsilon \end{array} \right. \right\}.$$

 $\mathcal{L}_{18} = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ contém quantidade par de 01's e ímpar de 0's} \}.$

 $\mathcal{L}_{19} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ começa com } 0 \text{ e contém } 00 \}.$



• $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0B, \\ A \to 0B \mid 1A, \\ \end{array} \middle| \begin{array}{l} B \to 0C \mid 1A, \\ C \to 0C \mid 1C \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, F, G, H, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0A, \\ A \rightarrow 1B \mid C, \\ B \rightarrow D \mid 1D, \end{array} \right. \left. \begin{array}{l} C \rightarrow A \mid 0E, \\ D \rightarrow B \mid 0C, \\ E \rightarrow F \mid G, \end{array} \right. \left. \begin{array}{l} F \rightarrow 0H \mid 1H, \\ G \rightarrow E \mid \varepsilon, \\ H \rightarrow G \end{array} \right\}.$$

 $\mathcal{L}_{20} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ não contém 01 como prefixo} \}.$

• $G_1 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B \mid \varepsilon, \\ A \to 0B \mid \varepsilon, \\ B \to 0B \mid 1B \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid A \mid B, \\ A \to \varepsilon, \\ B \to 0C \mid 1D, \end{array} \right| \left. \begin{array}{l} C \to 0D, \\ D \to 0D \mid 1D \mid \varepsilon, \end{array} \right\}.$$

 $\mathcal{L}_{21} = \{ w \in \Sigma^* = \{0,1\}^* \mid |w|_1 \text{ \'e par e } w \text{ n\~ao cont\'em a subcadeia } 11 \}.$

 $\mathcal{L}_{22} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ não contém três símbolos idênticos consecutivos} \}.$

• $G_1 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0B \mid 1A \mid \varepsilon, \quad B \rightarrow 0D \mid 1A \mid \varepsilon, \quad D \rightarrow 0E \mid 1A \mid \varepsilon, \\ A \rightarrow 0B \mid 1C \mid \varepsilon, \quad C \rightarrow 0B \mid 1E \mid \varepsilon, \quad E \rightarrow 0E \mid 1E \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, F, G, H, I, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow A \mid 1A \mid \varepsilon, \\ A \rightarrow B \mid 1B \mid \varepsilon, \\ B \rightarrow 0C \mid \varepsilon, \end{array} \right. \left. \begin{array}{l} C \rightarrow D \mid 0D \mid G \mid 0G \mid \varepsilon, \\ D \rightarrow E \mid 1E, \\ E \rightarrow 1F, \end{array} \right. \left. \begin{array}{l} F \rightarrow 0C, \\ G \rightarrow H \mid 1H, \\ I \rightarrow \varepsilon \end{array} \right. \left. \begin{array}{l} H \rightarrow I \mid 1I, \\ I \rightarrow \varepsilon \end{array} \right\}.$$

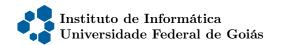
 $\mathcal{L}_{23} = \{w \in \Sigma^* = \{0,1\}^* \mid w \text{ contém o mesmo símbolo em todas as posições pares}\}.$

• $G_1 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0B \mid 1A \mid \varepsilon, \\ A \to 0C \mid 1C \mid \varepsilon, \\ B \to 0D \mid 1D \mid \varepsilon, \end{array} \right. \left. \begin{array}{l} C \to 1A \mid \varepsilon, \\ D \to 0B \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to A \mid B, \\ A \to 0C \mid \varepsilon, \\ B \to 1D \mid \varepsilon, \end{array} \right| \left. \begin{array}{l} C \to 0A \mid 1A \mid \varepsilon, \\ D \to 0B \mid 1B \mid \varepsilon \end{array} \right\}.$$



$$\mathcal{L}_{24} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w|_{01} = |w|_{10} \}.$$

$$\mathcal{L}_{25} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w| \text{ \'e m\'ultiplo de } 3 \}.$$

 $\mathcal{L}_{26} = \{ w \in \Sigma^* = \{0,1\}^* \mid |w| \text{ \'e uma sequência de subcadeias 01 ou 10} \}.$

 $\mathcal{L}_{27} = \{ w \in \Sigma^* = \{0,1\}^* \mid |w| \text{ \'e impar e } w \text{ cont\'em pelo menos uma ocorrência do símbolo } 1 \}.$

 $\mathcal{L}_{28} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ contém } 00 \text{ e não contém } 11 \}.$

• $G_1 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0B \mid 1A, \\ A \to 0B, \\ B \to 0D \mid 1A, \end{array} \right| \left| \begin{array}{l} C \to 0D \mid \varepsilon, \\ D \to 0D \mid 1C \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, F, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B, \\ A \to 0D \mid 1C, \\ B \to 0A, \end{array} \right. \left. \left. \begin{array}{l} C \to 0A, \\ D \to 0E \mid 1F \mid \varepsilon, \\ \end{array} \right. \left. \left. \begin{array}{l} E \to D, \\ F \to 0D \mid 0E \mid \varepsilon \end{array} \right. \right\}.$$

 $\mathcal{L}_{29} = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ contém pelo menos um } 0 \text{ e contém quantidade par de 1's} \}.$

• $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 1A \mid 0B, & B \to 0B \mid 1C \mid \varepsilon, \\ A \to 1S \mid 0C, & C \to 1B \mid 0C \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, F, G, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow B \mid 1A, \\ A \rightarrow 1S, \\ B \rightarrow 0E \mid 1C, \\ C \rightarrow 0D, \end{array} \right. \left. \begin{array}{l} D \rightarrow 0D \mid 1E, \\ E \rightarrow F, \\ F \rightarrow 0F \mid 1G \mid \varepsilon, \\ G \rightarrow 0G \mid 1F \end{array} \right\}.$$

 $\mathcal{L}_{30} = \{ w \in \Sigma^* = \{0,1\}^* \mid |w| \text{ \'e m\'ultiplo de 3 e } w \text{ termina com 11} \}.$

• $G_1 = (\{A, B, C, D, S\}, \{0, 1\}, P, S), \text{ com}$

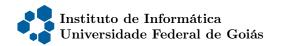
$$P = \left\{ \begin{array}{l} S \rightarrow 0B \mid 1B, \\ A \rightarrow 0S \mid 1S, \\ B \rightarrow 0A \mid 1C, \end{array} \right| \begin{array}{l} C \rightarrow 0S \mid 1D, \\ D \rightarrow 0B \mid 1B \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \rightarrow 0A \mid 1A \mid 0D \mid 1D, & C \rightarrow \varepsilon, \\ A \rightarrow 1B, & D \rightarrow 0E \mid 1E, \\ B \rightarrow 1C, & E \rightarrow 0S \mid 1S \end{array} \right\}.$$

 $\mathcal{L}_{31} = \{w \in \Sigma^* = \{0,1\}^* \mid |w| \text{ não contém a subcadeia } 00 \text{ ou a subcadeia } 11\}.$

 $\mathcal{L}_{32} = \{w \in \Sigma^* = \{0,1\}^* \mid \text{ todo par de 0's adjacentes ocorre antes de qualquer par de 1's adjacentes}\}.$



 $\mathcal{L}_{33} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ não começa com } 00 \text{ e não termina com } 11 \}.$

 $\mathcal{L}_{34} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ não contém pares de 1's consecutivos} \}.$

 $\mathcal{L}_{35} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ termina com } 0 \text{ ou com } 11 \}.$

• $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1B, \\ A \to 0A \mid 1B \mid \varepsilon, \\ \parallel C \to 0A \mid 1C \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to A \mid 0S \mid 1S \mid C, & C \to 1D, \\ A \to 0B, & D \to 1E, \\ B \to \varepsilon, & E \to \varepsilon \end{array} \right\}.$$

 $\mathcal{L}_{36} = \{w \in \Sigma^* = \{0,1\}^* \mid w \text{ contém quantidade par de 0's seguida de quantidade ímpar de 1's}\}.$

 $\mathcal{L}_{37} = \{w \in \Sigma^* = \{0,1\}^* \mid w \text{ começa com } 0, \text{ contém exatamente dois 1's e termina com } 00\}.$

• $G_1 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A, \\ A \to 0A \mid 1B, \\ B \to 0B \mid 1C, \end{array} \right. \left. \begin{array}{l} C \to 0D, \\ D \to 0E, \\ E \to 0E \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 0S, & C \to 0D, \\ A \to 1B, & D \to 0D \mid 0E, \\ B \to 0B \mid 1C, & E \to \varepsilon \end{array} \right\}.$$

 $\mathcal{L}_{38} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w = 0u1 \text{ ou } w = 1u0, \text{ com } u \in \Sigma^* \}.$

 $\mathcal{L}_{39} = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ contém um número ímpar de ocorrências de } 01 \}.$

• $G_1 = (\{A, B, C, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A \mid 1S, & B \to 0C \mid 1B \mid \varepsilon, \\ A \to 0A \mid 1B, & C \to 0C \mid 1S \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, F, S\}, \{0, 1\}, P, S), \text{ com}$

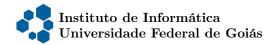
$$P = \left\{ \begin{array}{l} S \rightarrow 0B \mid 1A, & C \rightarrow 0B \mid 1C, \\ A \rightarrow 0B \mid 1A, & D \rightarrow 0E \mid 0F \mid 1D \mid \varepsilon, & F \rightarrow 0F \mid \varepsilon \\ B \rightarrow 0B \mid 1D, & \end{array} \right\}.$$

 $\mathcal{L}_{40} = \{ w \in \Sigma^* = \{0, 1\}^* \mid 0^n, \ n \in \mathbb{N}, e \ n \text{ \'e m\'ultiplo de 2 ou de 3} \}.$

 $\mathcal{L}_{41} = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ \'e um n\'umero bin\'ario maior que zero e m\'ultiplo de 3} \}.$

 $\mathcal{L}_{42} = \{ w \in \Sigma^* = \{0,1\}^* \mid w \text{ \'e n\'umero bin\'ario, n\~ao negativo, divis\'ivel por 4 (sem 0's iniciais redundantes)} \}.$

 $\mathcal{L}_{43} = \{w \in \Sigma^* = \{0,1\}^* \mid \text{ toda subcadeia de } w \text{ de comprimento 4 contém exatamente um 1}\}.$



$$\mathcal{L}_{44} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w|_0 \text{ é par } e \mid w|_1 \text{ é par.}$$

$$\mathcal{L}_{45} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w|_0 \text{ \'e par e } |w|_1 \text{ \'e impar.}$$

$$\mathcal{L}_{46} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w|_0 \text{ é par } e |w|_1 \text{ é divisível por } 3 \}.$$

$$\mathcal{L}_{47} = \{ w \in \Sigma^* = \{0, 1\}^* \mid |w| \text{ \'e impar e } w \text{ começa com } 1 \}.$$

•
$$G_1 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$$

$$P = \left\{ \begin{array}{l} S \to 1A, \\ A \to 0B \mid 1B \mid \varepsilon, \\ B \to 0A \mid 1A \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 1A, \\ A \to 0B \mid 0C \mid 1D \mid 1E \mid \varepsilon, & C \to 1A, \\ B \to 0A, & E \to 1A \end{array} \right\}.$$

 $\mathcal{L}_{48} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w = 0u \in |w| \text{ \'e impar ou } w = 1u \in |w| \text{ \'e par, com } u \in \Sigma^* \}.$

$$\mathcal{L}_{49} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w \text{ termina com } 010 \text{ e contém } 011 \}.$$

$$\mathcal{L}_{50} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w = 1u1, \text{ com } u \in \Sigma^*, \text{ e } w \text{ não contém } 11 \text{ e } 000 \}.$$

$$\mathcal{L}_{51} = \{ w \in \Sigma^* = \{0, 1\}^* \mid w = 0^{3n+5}, \ n \geqslant 0 \}.$$

•
$$G_1 = (\{A, B, S\}, \{0, 1\}, P, S), \text{ com}$$

$$P = \left\{ \begin{array}{l} S \to 0A, & C \to 0D, \\ A \to 0B, & D \to 0E, \\ B \to 0C, & E \to 0C \mid \varepsilon \end{array} \right\}.$$

• $G_2 = (\{A, B, C, D, E, S\}, \{0, 1\}, P, S), \text{ com}$

$$P = \left\{ \begin{array}{l} S \to 0A, & C \to 0D, \\ A \to 0B, & D \to 0E, \\ B \to 0C, & E \to B \mid \varepsilon \end{array} \right\}.$$