

2. Języki i gramatyki – odpowiedzi

2.1.

$$\begin{aligned} S &\rightarrow A \mid B \mid C \\ A &\rightarrow ab \mid aaaA \\ B &\rightarrow bbc \mid bbbB \\ C &\rightarrow ccca \mid cccC \end{aligned}$$

2.2.

$$\begin{aligned} S &\rightarrow A \mid B \\ A &\rightarrow a \mid ab \mid abA \\ B &\rightarrow b \mid ba \mid baB \end{aligned}$$

2.3.

$$\begin{aligned} S &\rightarrow aA \\ A &\rightarrow bB \mid \varepsilon \\ B &\rightarrow cC \mid \varepsilon \\ C &\rightarrow aA \mid \varepsilon \end{aligned}$$

lub:

$$S \rightarrow a \mid ab \mid abc \mid abcS$$

2.4.

$$\begin{aligned} S &\rightarrow abb \mid abbA \\ A &\rightarrow aab \mid aabS \end{aligned}$$

2.5.

$$\begin{aligned} S &\rightarrow aAa \\ A &\rightarrow bAcc \mid bBcc \\ B &\rightarrow cB \mid c \end{aligned}$$

2.6.

$$\begin{aligned} S &\rightarrow AB \\ A &\rightarrow aAb \mid ab \\ B &\rightarrow bBa \mid ba \end{aligned}$$

2.7.

$$\begin{aligned} S &\rightarrow bAa \\ A &\rightarrow aaAc \mid aaBc \\ B &\rightarrow aB \mid a \end{aligned}$$

2.8.

$$\begin{aligned} S &\rightarrow bAc \\ A &\rightarrow aAa \mid aBa \\ B &\rightarrow Ba \mid ba \end{aligned}$$

2.9.

$$S \rightarrow bAb$$

$$A \rightarrow aAa \mid aBa$$

$$B \rightarrow cBa \mid ca$$

2.10. (uwaga: zapis $x \in \{a, b\}^+$ oznacza słowa niepuste)

$$S \rightarrow aA \mid Aa \mid ab \mid ba$$

$$A \rightarrow bS \mid Sb$$

lub

$$S \rightarrow SS \mid aSb \mid bSa \mid ab \mid ba$$

2.11.

$$S \rightarrow aa \mid AaA \mid AaBaA$$

$$A \rightarrow a \mid b$$

$$B \rightarrow aB \mid bB \mid \varepsilon$$

2.12.

$$S \rightarrow AaaAbbbA \mid AbbbAaaa$$

$$A \rightarrow aA \mid bA \mid \varepsilon$$

2.13.

$$S \rightarrow bAb$$

$$A \rightarrow aAb \mid acb$$

2.14.

$$S \rightarrow aS \mid aSb \mid \varepsilon$$

2.15.

$$S \rightarrow aabbS \mid \varepsilon$$

2.16.

$$S \rightarrow aaaS \mid aaa$$

2.17.

$$S \rightarrow aSa \mid bSb \mid \varepsilon$$

2.18.

$$S \rightarrow aA \mid bB \mid \varepsilon$$

$$A \rightarrow aS \mid bC$$

$$B \rightarrow aC \mid bS$$

$$C \rightarrow aB \mid bA$$

2.19.

$$S \rightarrow abS \mid baS \mid \varepsilon$$

2.20.

$$S \rightarrow aSb \mid c$$

2.21.

$$S \rightarrow AB$$

$$S \rightarrow aAb \mid \varepsilon$$

$$S \rightarrow aB \mid a$$

2.22.

$$S \rightarrow aSa \mid aBa$$

$$B \rightarrow bB \mid \varepsilon$$

2.23.

$$S \rightarrow SS \mid (S) \mid \varepsilon$$

2.24.

$$S \rightarrow aA \mid a$$

$$A \rightarrow baA \mid aA \mid ba \mid a$$

2.25.

$$S \rightarrow aS \mid bS \mid \varepsilon$$

2.26.

$$S \rightarrow \varepsilon$$

2.27.

$$S \rightarrow a \mid b \mid ab \mid ba \mid \varepsilon$$

2.28.

$$S \rightarrow A0A0A$$

$$A \rightarrow 0A \mid 1A \mid \varepsilon$$

2.29.

$$S \rightarrow A00A$$

$$A \rightarrow 0A \mid 1A \mid \varepsilon$$

2.30.

$$S \rightarrow A10 \mid A11$$

$$A \rightarrow 0A \mid 1A \mid \varepsilon$$

2.31.

$$S \rightarrow 01A \mid 11A$$

$$A \rightarrow 0A \mid 1A \mid \varepsilon$$

2.32.

$$S \rightarrow ABC$$

$$A \rightarrow aAb \mid ab$$

$$B \rightarrow bBa \mid ba$$

$$C \rightarrow aCb \mid ab$$

2.33.

$$S \rightarrow aSb \mid aAb$$

$$A \rightarrow bAa \mid bBa$$

$$B \rightarrow aBb \mid ab$$

2.34.

$$S \rightarrow AC$$

$$A \rightarrow aAb \mid aBb$$

$$B \rightarrow bBa \mid ba$$

$$C \rightarrow aCb \mid ab$$

2.35.

$$S \rightarrow aAb$$

$$A \rightarrow aA \mid bA \mid \varepsilon$$

lub

$$S \rightarrow aA$$

$$A \rightarrow aA \mid bA \mid b$$

2.37.

(d) $S \rightarrow aA \mid bB$

$$A \rightarrow aA \mid bB \mid cC$$

$$B \rightarrow bB \mid cC \mid \varepsilon$$

$$C \rightarrow cC \mid \varepsilon$$

2.46

$$S \rightarrow SS \mid aSa \mid bSb \mid \varepsilon$$