
QUIZ 12

1. Consider the grammar $G = (V = \{S, A, C, X, Y\}, \Sigma = \{a, b, c\}, R, S)$ where the set of rules R is as follows:

$$\begin{aligned} S &\rightarrow AX|YC \\ A &\rightarrow aA|\epsilon \\ C &\rightarrow cC|\epsilon \\ X &\rightarrow bXc|\epsilon \\ Y &\rightarrow aYb|\epsilon \end{aligned}$$

Which of the following strings can be derived in **one** step from $aaAbXc$?

- (A) $aaaAbbXcc$
- (B) $aaAbbXcc$
- (C) $aaAXbXc$
- (D) Nothing because $aaAbXc$ is not the start symbol of the grammar

Correct answer is (B).

2. Consider the grammar $G = (V = \{S, A, C, X, Y\}, \Sigma = \{a, b, c\}, R, S)$ where the set of rules R is as follows:

$$\begin{aligned} S &\rightarrow AX|YC \\ A &\rightarrow aA|\epsilon \\ C &\rightarrow cC|\epsilon \\ X &\rightarrow bXc|\epsilon \\ Y &\rightarrow aYb|\epsilon \end{aligned}$$

Which of the following strings can be derived from S in zero or more steps?

- (A) $aaaa$
- (B) $aabbbc$
- (C) $aaAbXc$
- (D) $abbccc$

Correct answer is (C).

3. Consider the grammar $G = (V = \{S, A, C, X, Y\}, \Sigma = \{a, b, c\}, R, S)$ where the set of rules R is as follows:

$$\begin{aligned} S &\rightarrow AX|YC \\ A &\rightarrow aA|\epsilon \\ C &\rightarrow cC|\epsilon \\ X &\rightarrow bXc|\epsilon \\ Y &\rightarrow aYb|\epsilon \end{aligned}$$

The set of strings (over Σ) derivable from A is

- (A) $\mathbf{L}(a^*)$
- (B) Strings with an even number of as
- (C) \emptyset because A is not the start symbol

(D) $\{a^n b^n \mid n \geq 0\}$

Correct answer is (A).

4. Consider the grammar $G = (V = \{S, A, C, X, Y\}, \Sigma = \{a, b, c\}, R, S)$ where the set of rules R is as follows:

$$\begin{array}{ll} S & \rightarrow AX|YC \\ A & \rightarrow aA|\epsilon \\ C & \rightarrow cC|\epsilon \\ X & \rightarrow bXc|\epsilon \\ Y & \rightarrow aYb|\epsilon \end{array}$$

$\mathbf{L}(G)$ is

- (A) $\mathbf{L}(a^* b^* c^*)$
- (B) $\{a^n b^n c^n \mid n \geq 0\}$
- (C) $\{a^i b^j c^k \mid i = j \text{ or } j = k\}$
- (D) $\{a^i b^j c^k \mid i = k\}$

Correct answer is (C).

5. Let $G = (V, \Sigma, R, S)$ be a context-free grammar, where V is the set of variables, Σ is the set of terminals, R is the set of rules, and S is the start symbol. Which of the following is true about the language defined by G ? Pick the most precise answer.

- (A) $\mathbf{L}(G) \subseteq V^*$
- (B) $\mathbf{L}(G) \subseteq \Sigma^*$
- (C) $\mathbf{L}(G) \subseteq (V \cup \Sigma)^*$
- (D) $\mathbf{L}(G) \subseteq V^* \cup \Sigma^*$

Correct answer is (B).