

1. Consider the grammar with following productions and S as start symbol.

$$\begin{aligned} S &\rightarrow AB/a \\ A &\rightarrow BC/b \\ B &\rightarrow aB/C \\ C &\rightarrow aC/B \end{aligned}$$

- i) Which symbols are non-reachable ?
ii) Which symbols are non-generating ?

2. Consider the unrestricted grammar with S as start symbol and following productions.

$$\begin{aligned} S &\rightarrow LFabR \\ FR &\rightarrow BR \mid E, \quad LB \rightarrow LF \\ aB &\rightarrow Ba, \quad bB \rightarrow Bb \\ aE &\rightarrow Ea, \quad bE \rightarrow Eb, \quad LE \rightarrow \epsilon \\ Fa &\rightarrow aF, \quad aFb \rightarrow aabFb, \quad bFb \rightarrow bbF \end{aligned}$$

- i) The language generated by the grammar is L . Which of the following is/are correct ?
(A) L is regular
(B) L is a DCFL
(C) L is a CFL
(D) L is NOT a CFL

- ii) If $S \xRightarrow{i} x \in \{a, b\}^*$ and $|x| = 6$ then $i = \underline{\hspace{1cm}}$.

3. Which of the following is/are CFLs ?

- (A) $\{a^m b^n c^p d^q \mid m = n + p + q\}$
(B) $\{a^m b^n c^p d^q \mid n = m + p + q\}$
(C) $\{a^m b^n c^p d^q \mid m + q = n + p\}$
(D) $\{a^m b^n c^p d^q \mid m \neq n, p \neq q\}$