TOC

ASSIGNMENT - 2

1.	If $G = (\{S\}, \{0, 1\}, \{S \rightarrow 0S1, S \rightarrow \Lambda\}, S)$, find $L(G)$.
2.	If $G = (\{S\}, \{a\}, \{S \rightarrow SS\}, S)$, find the language generated by G.
3.	Let $G = (\{S, C\}, \{a, b\}, P, S)$, where P consists of $S \rightarrow aCa$, $C \rightarrow aCa \mid b$. Find $L(G)$.
4.	If G is $S \rightarrow aS \mid bS \mid a \mid b$, find $L(G)$.
5.	Let L be the set of all palindromes over $\{a, b\}$. Construct a grammar G generating L.
6.	Construct a grammar generating $L = \{wcw^T \mid w \in \{a, b\}^*\}$. ***Solution*** Let $G = (\{S\}, \{a, b, c\}, P, S)$, where P is defined as $S \rightarrow aSa \mid bSb \mid c$. It is easy to see the idea behind the construction. Any string in L is generated by recursion as follows: (i) $c \in L$; (ii) if $x \in L$, then $wxw^T \in L$. So, as in the earlier example, we have the productions $S \rightarrow aSa \mid bSb \mid c$.
7.	Let $G = (\{S, A_1\}, \{0, 1, 2\}, P, S)$, where P consists of $S \rightarrow 0SA_12$, $S \rightarrow 012$, $2A_1 \rightarrow A_12$, $1A_1 \rightarrow 11$. Show that $$L(G) = \{0^n1^n2^n \mid n \geq 1\}$$
8.	Construct a grammar G generating $\{a^nb^nc^n \mid n \geq 1\}$.
9.	Let $G = (\{S, A_1, A_2\}, \{a, b\}, P, S)$, where P consists of $$S \rightarrow aA_1A_2a,\ A_1 \rightarrow baA_1A_2b,\ A_2 \rightarrow A_1ab,\ aA_1 \rightarrow baa,\ bA_2b \rightarrow abab$$ Test whether $w = baabbabaaabbaba$ is in $L(G)$.
10.	Consider the grammar G given by $S \rightarrow 0SA_12$, $S \rightarrow 012$, $2A_1 \rightarrow A_12$, $1A_1 \rightarrow 11$. Test whether (a) $00112 \in L(G)$ and (b) $001122 \in L(G)$.
11.	Write a note on Chomsky Hierarchy.
12.	Define Grammar

13	Find the highest type number which can be applied to the following productions: (a) $S \to Aa$, $A \to c \mid Ba$, $B \to abc$ (b) $S \to ASB \mid d$, $A \to aA$ (c) $S \to aS \mid ab$
14	Consider the grammar G given by $S \to 0SA_12$, $S \to 012$, $2A_1 \to A_12$, $1A_1 \to 11$. Test whether (a) $00112 \in L(G)$ and (b) $001122 \in L(G)$.
15	Construct a context-free grammar generating (a) $L_1 = \{a^n b^{2n} \mid n \geq 1\}$ (b) $L_2 = \{a^m b^n \mid m > n,\ m,\ n \geq 1\}$ (c) $L_3 = \{a^m b^n \mid m < n,\ m,\ n, \geq 1\}$ (d) $L_4 = \{a^m b^n \mid m,\ n \geq 0,\ m \neq n\}$
16	Construct a grammar accepting $L = \{w \in \{a, b\}^* \mid$ the number of a's in w is divisible by $3\}$.
17	Construct a grammar G such that $L(G) = \{w \in \{a, b\} \mid w$ has an equal number of a's and b's$\}$.
18	Construct a grammar G accepting the set L of all strings over $\{a, b\}$ having more a's than b's.
19	Construct a grammar G accepting all strings over $\{a, b\}$ containing an unequal number of a's and b's.
20	Show that the set of all non-palindromes over $\{a, b\}$ is a context-free language.
21	**4.1** Find the language generated by the following grammars: (a) $S \to 0S1 \mid 0A1$, $A \to 1A \mid 1$ (b) $S \to 0S1 \mid 0A \mid 0 \mid \mid 1B \mid 1$, $A \to 0A \mid 0$, $B \to 1B \mid 1$ (c) $S \to 0SBA \mid 01A$, $AB \to BA$, $1B \to 11$, $1A \to 10$, $0A \to 00$ (d) $S \to 0S1 \mid 0A1$, $A \to 1A0 \mid 10$ (e) $S \to 0A \mid 1S \mid 0 \mid 1$, $A \to 1A \mid 1S \mid 1$
22	Let $G = (\{A, B, S\}, \{0, 1\}, P, S)$, where P consists of $S \to 0AB$, $A_0 \to S0B$, $A_1 \to SB1$, $B \to SA$, $B \to 01$. Show that $L(G) = \emptyset$.

23.	Find the language generated by the grammar $S \to AB$, $A \to A1 \mid 0$, $B \to 2B \mid 3$. Can the above language be generated by a grammar of higher type?