

IEC College of Engineering and Technology, Greater Noida
Department of CSE/IT
Even Sem., Session 2022-23
Assignment-3

Submission Date: DD/MM/YY

Subject Name with Code: Theory of Automata and Formal Languages (KCS-402)

1. Check whether the grammar is ambiguous or not.
 $R \rightarrow R+R / RR / R^* / a / b / c$. Obtain the string $w = a+b*c$
2. Eliminate unit productions in the grammar. $S \rightarrow A/bb$ $A \rightarrow B/b$ $B \rightarrow S/a$.
3. Consider the grammar with the production $S \rightarrow aSS$ $A \rightarrow b$. Compute the string aababbb with the left most and right most derivation. Draw the derivation tree.
4. Find out whether the language $L = \{x^n y^n z^n \mid n \geq 1\}$ is context free or not.
5. Convert the following CFG into CNF
 $S \rightarrow XY \mid Xn \mid p$
 $X \rightarrow mX \mid m$
 $Y \rightarrow Xn \mid o$
6. Convert the following CFG into CNF $S \rightarrow ASA \mid aB$, $A \rightarrow B \mid S$, $B \rightarrow b \mid \epsilon$.
7. Define Chomsky hierarchy.
8. Is context free language closed under union? If yes, give an example.
9. Remove useless productions from the given productions: $S \rightarrow AB|ab$, $A \rightarrow aA|B|a$, $B \rightarrow D|E$.
10. Reduce the given grammar $G=(\{S,A,B\}, \{a,b\}, P, S)$ to Chomsky Normal Form.
Where P is defined as:
 $S \rightarrow bA \mid aB$
 $A \rightarrow bAA \mid aS \mid a$
 $B \rightarrow aBB \mid bS \mid b$
11. Discuss inherent ambiguity of context free languages with suitable examples. Construct the context free grammar that accepts language $L = \{a^i b^j c^k \mid i = j \text{ or } j = k; i, j, k \text{ are positive integers}\}$.
12. Define parse tree. Find parse tree for the string abbcde considering the productions-
 $S \rightarrow aAcBe$
 $A \rightarrow Ab$
 $A \rightarrow b$
 $B \rightarrow d$
Is this ambiguous? Justify.
13. Construct the CFG for the Language $L = \{a^{2n} b^n \mid n \geq 3\}$.
14. Convert the following CFG to its equivalent GNF: $S \rightarrow AA \mid a$, $A \rightarrow SS \mid b$.

15. Design the CFG for the following language:
- i) $L = \{0^m 1^n \mid m \neq n \text{ \& } m, n \geq 1\}$
 - ii) $L = \{a^l b^m c^n \mid l + m = n \text{ \& } l, m \geq 1\}$
16. Prove that the following Language $L = \{a^n b^n c^n\}$ is not Context Free.
17. Define Context Free Grammar (CFG).
18. Write the Context Free Grammar (CFG) for regular expression $(0+1)^*$.
19. What are Right Linear grammar and Left Linear grammars?
20. Grammar G is given with the production $S \rightarrow aSS$, $A \rightarrow b$. Compute the string $w = aababbb$ with the Leftmost and Rightmost derivation Tree.
21. Check whether the grammar is ambiguous or not. $R \rightarrow R+R / RR / R^* / a / b / c$. Obtain the string $w = a+b^*c$.