

CSE331: Automata & Computability
Assignment 4
Total Marks - 20

Construct Context-Free Grammar for the Following.

1. $a^n b^m c^k d^k e^{m^n}$; where $n, m, k \geq 0$. [3 marks]
2. $a^n b^m c^m d^k e^{k^n}$; $n \geq 0, m \geq 1, k \geq 2$. [3 marks]
3. The number of 0s is greater than the number of 1's. [3 marks]
4. $a^m b^n$; $m > 2n$ and $m, n \geq 1$ [3 marks]
5. $a^n b a^m b a^{n+m}$; $m, n \geq 1$ [3 mark]

Left Most Derivation, Right Most Derivation, Ambiguity.

6. $S \rightarrow aSc \mid X$
 $X \rightarrow bXc \mid \epsilon$
[Here, start variable is S]

Given the CFG of question 6, answer the following:

- a) show Left Most Parse Tree for the String "aaabbccccc" [1 mark]
- b) show Right Most Parse Tree for the String "aaabbccccc" [1 mark]

7. $S \rightarrow XY \mid MN$
 $X \rightarrow 0X1 \mid 01$
 $Y \rightarrow 2Y \mid 2$
 $M \rightarrow 0M \mid 0$
 $N \rightarrow 1N2 \mid 12$
[Here, the start variable is S]

Given The CFG of Question 7, answer the following:

- a) Left Most Derivation of the string "0001112" [0.5 marks]
- b) Right Most Derivation of the string "0001112" [0.5 marks]
- c) Show that the grammar is ambiguous [2 marks]