Homework 5:

Q1: Design a CFG that accepts the language$\{0^m\ 1^n | \ 0 < m < n\}$, Is your grammar ambiguous? If yes: show an example. If no: give a proof that it is not ambiguous.

Q2: from this CFG (starting variable is E):-

$$\begin{aligned} I &\rightarrow a \mid b \mid Ia \mid Ib \mid I0 \mid I1 \\ E &\rightarrow I \mid (E) \mid E + E \mid E * E \end{aligned}$$

Give the Left- and Rightmost Derivations for the following strings

- aa1 * (b00)
- (b2) + (a10) * b

Draw all parse trees for deriving the following strings

- a1 + (b00)
- (ab * a00b) + bb11

Q3: Using the CFG of Q2, Give three examples for strings that have two parse trees. For each string draw the two parse trees.

Q4: Using the CFG of Q2, can you find a string that can be generated by three parse trees using leftmost derivation? If you find, draw these three parse trees.

Q5: Select a regular language by yourself using alphabet 0,1 and represent it using these methods:- (you will represent the same language using different methods)

- Regular Expressions (give the expression only)
- Context Free Grammars (give the variables, rules, and start variable)
- FDA (draw the FDA graph)

Q6: Give context-free grammars that generate the following languages:

- w = 10
- { w ∈ {0, 1}* | |w| is even } , |w| means the size of the string
- { w ∈ {0, 1}* | the length of w is odd and the middle symbol is 0 }