# ASSIGNMENT - CONTEXT FREE GRAMMARS

1. Construct the derivation tree whose yield is aabbaa.
   S → aAS | a,
   A → SbA | SS | ba

2. S → 0B | 1A,
   A → 0 | 0S | 1AA,
   B → 1 | 1S | 0BB
   For string 00110101 find

   - left most derivation

   - right most derivation

   - derivation tree

3. Find the grammar for the following languages

   i $L = (aaa^* + b)$

   ii $L = \{a^n b^n : n \geq 1\}$

   iii $L = \{a^n b^{n+1} : n \geq 2\}$

   iv $L = ww^r : w \in \{a, b\}*$

   v $L = \{a^n b^m : n \leq m + 3\}$

   vi $L = \{a^n b^m : 2n \leq m \leq 3n\}$

   vii $L = \{a^n b^m c^k : k = |n - m|\}$

4. Show that the following grammar is ambiguous
   S → aSbS | bSaS | $\epsilon$

5. Show that the following grammar is ambiguous
   S → AB | aaB,
   A → a | Aa,
   B → b

6. Can the grammar for regular languages cannot be ambiguous or inherently ambiguous?

7. E → E + E,
   E → E * E,
   E → id
   For input: 2+3*4 find

   - left most derivation

   - right most derivation

   - derivation tree

8. Reduce or Remove useless productions from the following grammar

   i S → AB,
   A → a,
   B → b,
   B → C,
   E → c

   ii S → AB | CA,
   B → BC | AB,
   A → a,
   C → aB | b

   iii S → aAa,
   A → Sb | bCC | DaA,
   C → abb | DD,
   E → aC,
   D → aDA

9. Eliminate $\epsilon$-productions, Eliminate any unit productions in the resulting grammar, Eliminate any useless symbols in the resulting grammar. Put the resulting grammar into Chomsky Normal Form

   i S → ASB | $\epsilon$,
   A → aAS | a,
   B → bb | A | SbS

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[0]Don't consider comma , or full-stop . as the part of any input or terminal symbols

ii S → 0A0 | 1B1 | BB,
   A → C,
   B → S | A,
   C → S | $\epsilon$

iii S → AAA | B,
   A → aA | B,
   B → $\epsilon$

iv S → aAa | bBb | $\epsilon$,
   A → C | a,
   B → C | b,
   C → CDE | $\epsilon$,
   D → B | A | ab

10. Convert the following grammar into Greibach Normal form

   i S → aSb | bSa | a | b

   ii S → aSb | ab

   iii S → ab | aS | aaS

   iv S → ABb | a,
      A → aaA | B,
      B → bAb