1) Consider the following language
   \[ A = \{ xw \mid x, w \in \{0,1\}^* \text{ and no. of 0's in } x \geq \text{ no. of 1's in } x \} \]
   Which statements are true about \( A \)?
   - [ ] A is a context free language.
   - [ ] A is context free but not a regular language.
   - [ ] A is a regular language.
   - [ ] A is not a context free language.

2) What is the language of the following grammar?
   \[ S \rightarrow SS | aSaSb | aSbSa | bSaSa | \epsilon \]
   - [ ] Set of all string of a's and b's such that all string contains atleast 2 a's and 1 b.
   - [ ] Set of all string of a's and b's such that number of a's are 1 more than number of b's.
   - [ ] Set of all string of a's and b's such that number of a's are 2 more than number of b's.
   - [ ] Set of all string of a's and b's such that number of a's are twice the number of b's.

3) Consider the following two languages.
   \[ A = \{ uu^r \# uu^r \mid u \in \{0,1\}^* \}, \text{ where } u^r \text{ is the reverse of } u \]
   \[ B = \{ a^ib^jc^k \mid i = j \text{ or } j = k \} \]
   - [ ] Only A is a CFL.
   - [ ] Only B is a CFL.
   - [ ] Both A and B are CFL.
   - [ ] None of them is CFL.
4) Consider the following grammar
\[ S \rightarrow 0A \mid 1B \]
\[ A \rightarrow 0AA \mid 1S \mid 1 \]
\[ B \rightarrow 1BB \mid 0S \mid 0 \]
Which of the following statements are true about the grammar?

- Grammar is not ambiguous.
- Grammar is ambiguous.
- Grammar generates string 001110.
- None of the above

5) Consider the following language.
\[ A = \{ a^{2^n} \mid n \geq 0 \} \]
Which of the following statements are true about the language.

- We can write an unambiguous grammar for this language.
- We can write an ambiguous grammar for this language.
- There exist only one unambiguous grammar for this language.
- There exist only one ambiguous grammar for this language.

6) Consider the following grammar G
\[ S \rightarrow aSB \mid \epsilon \]
Which of the following production rule should we add to the grammar so that the L(G) becomes "Set of all strings of a's and b's such that in all prefixes of the string, number of a's are more than or equal to number of b's."

- \[ S \rightarrow aBl \]
- \[ S \rightarrow aSB \]
- \[ S \rightarrow aS \]
- \[ S \rightarrow aS \]
- \[ S \rightarrow aS \]

7) Consider the following grammar
\[ S \rightarrow 1S \mid 0A0S \mid \epsilon \]
\[ A \rightarrow 1A \mid \epsilon \]
Which of the following string cannot be generated by this grammar?
- 010101001
- 10101010001
- 102130030125
- 1010 (\epsilon_1)^{10} 0^{20}
- 1^{25} (0^1)^{10} 0^{20}
8) Let $G$ be a grammar such that no production rule has $a$ on its right-hand side. Let $w$ be a string in $L(G)$ such that length of $w$ is $n$ and $w$ has a derivation of $m$ steps. Then what is the number of nodes in the parse tree of $w$ corresponding to that derivation?

- $2m-1$
- $n+1$
- $m+n$
- $2m+n$

9) Consider the following two languages

\[ A = \{ a^n b^m c^n \mid n, m \geq 0 \} \]
\[ B = \{ a^n b^m d^n \mid n, m \geq 0 \} \]

- Only $A$ is context-free.
- Only $B$ is context-free.
- Both $A$ and $B$ are context-free.
- None of them are context-free.

10) Which of the following statements about context-free languages are true?

- Every CFL has a grammar in Chomsky Normal Form.
- Every CFL has an unambiguous CFG.
- Let $G$ be a CFG and $w$ be a string in $L(G)$. Then the number of leaves in a parse tree of $w$ with respect to $G$ can be more than the length of $w$.
- There exists a regular language that is not context-free.