CS & IT ENGINEERING

Theory of Computation

Push Down Automata

DPP 01 Discussion Notes

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TOPICS TO BE COVERED

01 Question

02 Discussion

Q.1 [MCQ]

Consider the following grammar:

$$S \rightarrow abSba \mid bSb \mid aSa \mid a \mid b \mid \in$$

What is the language generated by above grammar?

A. CFG that generates all palindromes over alphabet (a, b).

B. CFG that generates all palindromes over alphabet (a, b) that do not contain substring "ab".

C. CFG that generates all palindromes over alphabet (a, b) that contain substring "aa".

D. CFG that generates all palindromes over alphabet (a, b) that do not contain substring "aa".

Q.2 Consider the following grammars: **[MCQ]**

G_1: $S \to aSc \mid \$B$, $B \to bBc \mid \$$ $\to b^n \$ c^n$

G_2: $S \to aaScc \mid \$B$, $B \to bBc \mid \$$ $\to b^n \$ c^n$

G_3: $S \to aSc \mid \$B$, $B \to bbBcc \mid \$$ $\to b^{2n} \$ c^{2n}$

Which of the following is true regarding G_1, G_2 and G_3?

A. ~~$L(G_1) \subseteq L(G_2)$~~, $L(G_2) \subseteq L(G_3)$

B. $L(G_2) \subseteq L(G_3)$, $L(G_1) \subseteq L(G_3)$

C. $L(G_1) \subseteq L(G_3)$, $L(G_3) \subseteq L(G_2)$

D. $L(G_2) \subseteq L(G_1)$, $L(G_3) \subseteq L(G_1)$ ✓

$L(G_1) = \boxed{a^m \$ b^n \$ c^n c^m}$

$L(G_2) = \boxed{a^{2m} \$ b^n \$ c^n c^{2m}}$ subset of

$L(G_3) = \boxed{a^m \$ b^{2n} \$ c^{2n} c^m}$

Q.3 Consider the following context free grammar: **[McQ]**

$S \rightarrow aA \mid aBB$

$A \rightarrow aaA \mid \epsilon$

$\boxed{\begin{array}{l} B \rightarrow bB \mid bbC \\ C \rightarrow B \end{array}}$

$S \rightarrow aA \mid \cancel{aBB}$

$A \rightarrow aaA \mid \epsilon$

$S \rightarrow aA$

$A \rightarrow aaA \mid \epsilon \Rightarrow$

$S \rightarrow aA \mid a$

$A \rightarrow aaA \mid aa$

What will be the equivalent simplified CFG for the given grammar?

A.
$S \rightarrow aA \mid a$
$A \rightarrow aaA \mid aa \mid b$

B. ✓
$S \rightarrow aA \mid a$
$A \rightarrow aaA \mid aa$

C.
$S \rightarrow aAa \mid B$
$A \rightarrow aaA \mid aa$
$B \rightarrow bB \mid bb$

D.
$S \rightarrow aAa \mid B$
$A \rightarrow aA \mid b$
$B \rightarrow bB \mid bb \mid a$

Q.4

Consider the following grammar:

[MSQ]

$$S \rightarrow AB$$
$$A \rightarrow BaB \mid a$$
$$B \rightarrow \boxed{bbA}$$

⇒ abba

Which of the following is true regarding given grammar?

A. Every string of the above grammar have at least two a's.

B. ~~Every string have three consecutive a's.~~

C. ~~Every string have alternate a and b.~~

D. Every string have b's in multiple of 2.

Q.5 Consider the following grammar G: **[NAT]**

$S \rightarrow XA \mid BB$

$B \rightarrow b \mid SB$

$X \rightarrow b$

$A \rightarrow a$

After converting above grammar into GNF how many productions are there in the grammar?

$= 18$

$S \rightarrow \boxed{X}A \mid \boxed{B}B$

$B \rightarrow \boxed{b}B' \mid \boxed{X}ABB' \mid \boxed{b} \mid \boxed{X}AB$

$B' \rightarrow \boxed{B}BB' \mid \boxed{B}B$

$X \rightarrow \boxed{b}$

$A \rightarrow \boxed{a}$

$B \rightarrow b \mid SB$

$\Downarrow$

$B \rightarrow b \mid XAB \mid \boxed{B}BB$

$\Downarrow$

$$\boxed{\begin{array}{l} B \rightarrow bB' \mid XABB' \mid b \mid XAB \\ B' \rightarrow BBB' \mid BB \end{array}}$$

5 $S \rightarrow bA \mid bB'B \mid bABB'B \mid bB \mid bABB$

4 $B \rightarrow bB' \mid bABB' \mid b \mid bAB$

8 $B' \rightarrow bB'BB' \mid bABB'BB' \mid bBB' \mid bABBB' \mid bB'B \mid bABB'B \mid bB \mid bABB$

1 $A \rightarrow a$

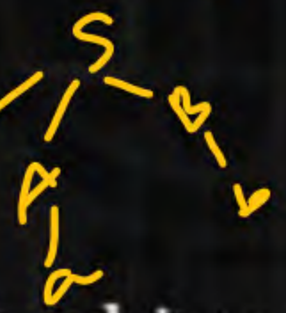
Q.6 Which of the following is true?

[MSQ]

A. A grammar is called ambiguous if (No. of parse tree's = No. of left most derivation = Number of Right most derivation) > 1 ✓

B. Production of the form $\boxed{A \to a}$ is known as $\underbrace{\text{unit production}}$. ✓

C. CNF is also known as binary standard form. ✓



D. In left-most derivation, right most non-terminal is substituted with its production to derive a string. ✗

Q.7 Given the following two grammars: **[MCQ]**

aab aab aab

Amb

G_1: $S \to AB \mid aaB$

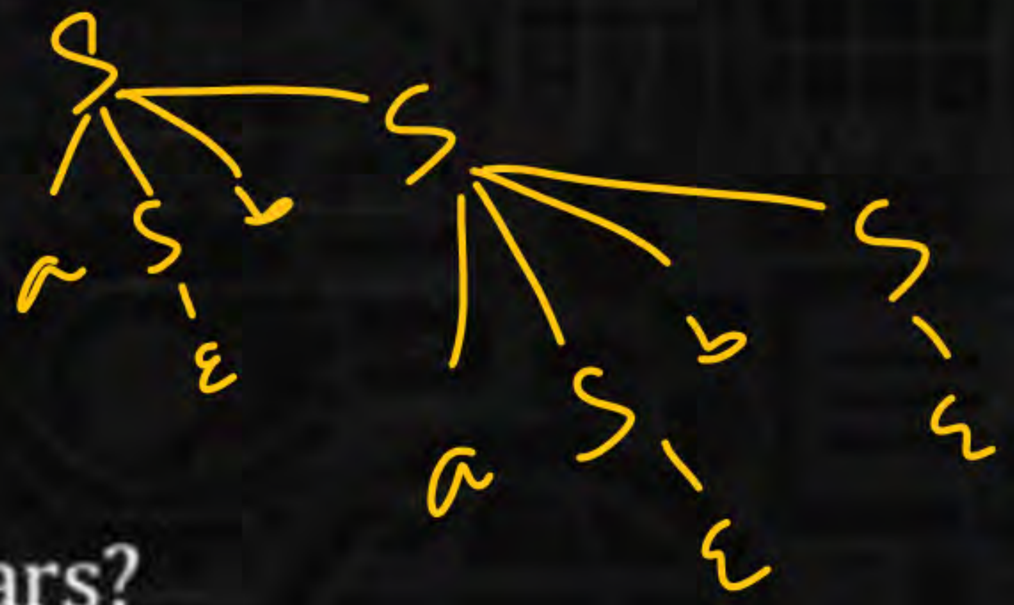
$A \to a \mid Aa$

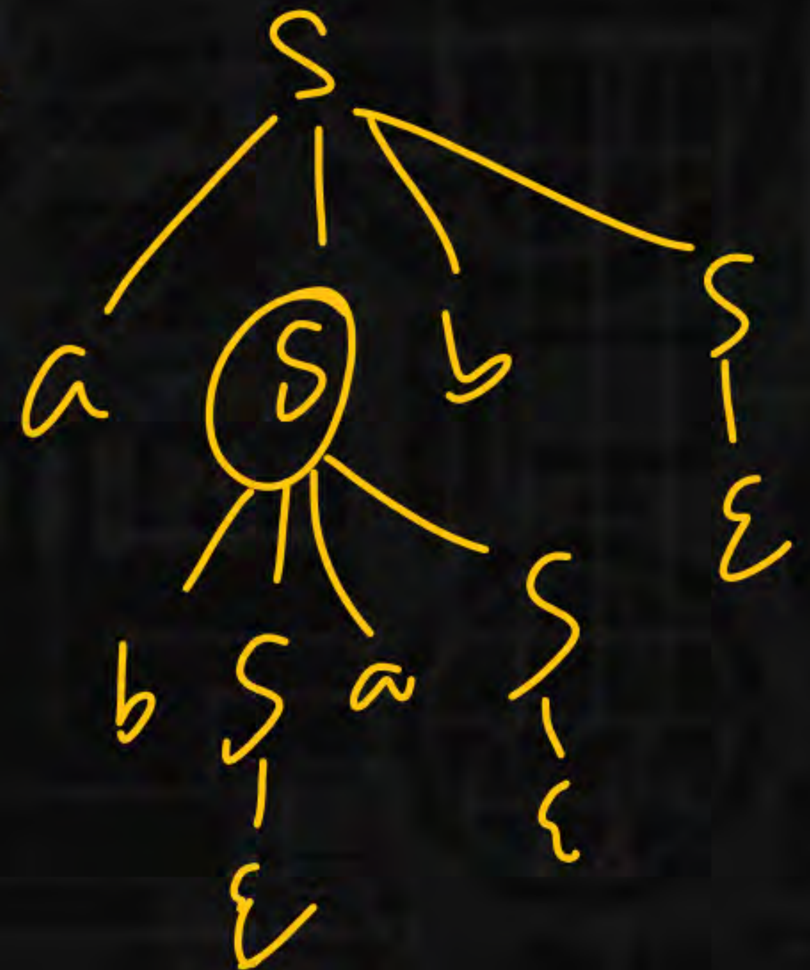
$B \to b$

abab

Amb G_2: $S \to aSbS \mid bSaS \mid \epsilon$

What is true regarding above grammars?





A. Both G_1 and G_2 are ambiguous.

B. Both G_1 and G_2 are unambiguous.

C. Only G_1 is ambiguous.

D. Only G_1 is unambiguous.

Q.8

Consider the following languages [MCQ]

$L_1 = \{a^n b^{n+m} c^m \mid n, m \geq 0\}$ $= \underbrace{a^n b^n}\underbrace{b^m c^m}$ $\longrightarrow$ non reg

$L_2 = \{a^p b^q c^{p+q} \mid p, q \geq 0\}$ $= a^p b^q c^q c^p$

Which of the following is true?

A. Only L_1 is Regular.

B. Only L_2 is Regular.

C. Both L_1 and L_2 are Regular.

D. None of these


THANK YOU GW
SOLDIERS !