Question 1:

a) $L1 = \{ a^n b^n \mid n \geq 1 \}$

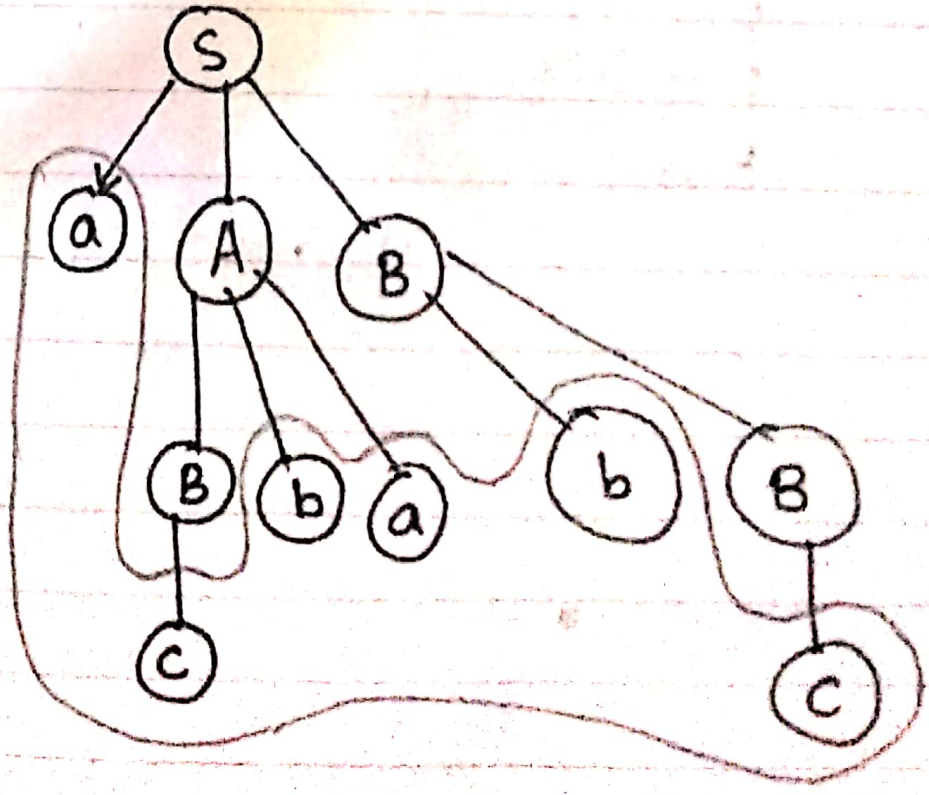
$S \rightarrow aSb \mid ab$

b) $L2 = \{ a^n b^m a^n \mid n \geq 1 \}$

$A \rightarrow aAc \mid bA \mid \lambda$

Q2

$w = acbabc$



Question 03

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

Question no 4

aB (Right Most)

aaBB

aaBaBB

aaBaBbS

aaBaBbbA

aaBaBbba

aaBabbba

aaaBBabbba

aaabbabbba

left (Most)

aB

aaBB

aaaBBB

aaabBB

aaabbB

aaabbaBB

aaabbabbS

aaabbabbbA

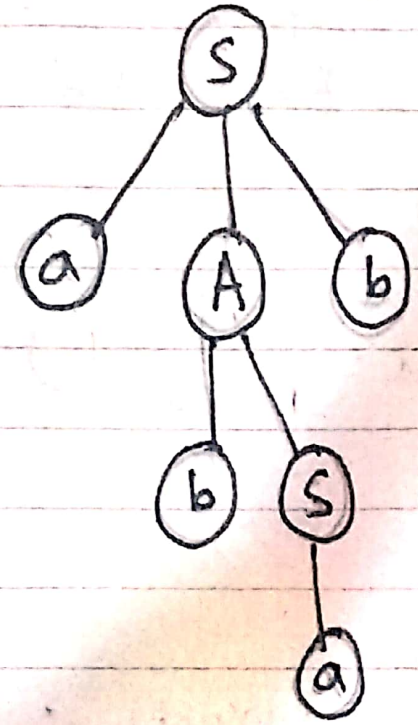
aaabbabbba

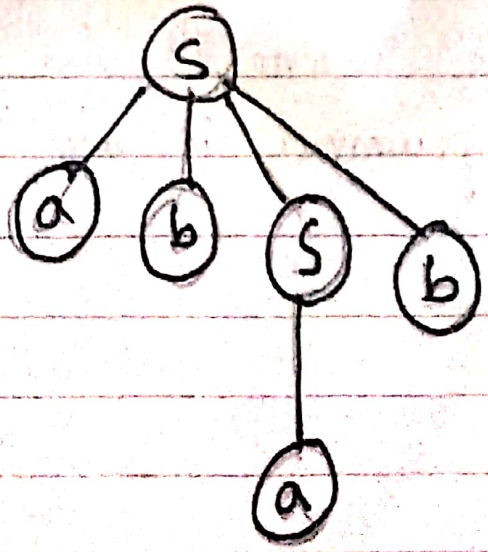
aababbabb

abab

Question # 05

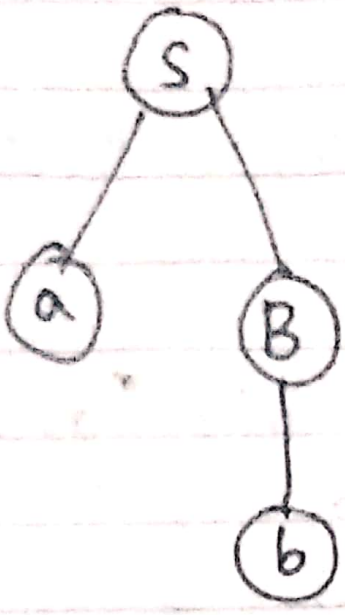
we have to generate String "abab"

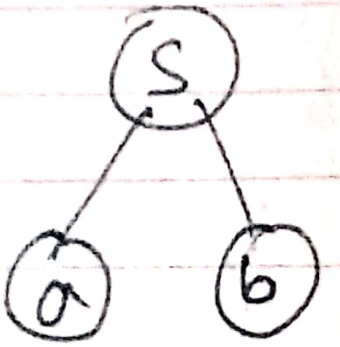




Two different structure trees so the grammer is Ambigous.

Question # 06





Two different structure tree on the same string ab So the grammer is ambigous.

S → ASA | aB
A → B | S
B → b | c

Question # 07

S → aAbB
A → aA | a
B → bB | b

Convert into CNF

S → aAbB
A → aA | a
B → bB | b
C → a
D → b
E → DB
F → AE

S → CF
A → CA | a
B → DB | b

Question # 08

$S \rightarrow ASA \mid aB$

$A \rightarrow B \mid S$

$B \rightarrow b \mid \epsilon$

- Step 1: NULL production Remove

NULL Variables :

$\{A, B\}$

$S \rightarrow ASA \mid aB \mid AS \mid SA \mid S \mid a$

$A \rightarrow B \mid S$

$B \rightarrow b$

Step 2: unit production Remove

unit productions

$S \rightarrow S$

$A \rightarrow B$

$A \rightarrow S$

$S \rightarrow ASA \mid aB \mid AS \mid SA \mid a$

$A \rightarrow b \mid ASA \mid aB \mid AS \mid SA \mid a \mid ab$

$B \rightarrow b$

Step 3:

$S \rightarrow ASA \mid aB \mid AS \mid SA \mid a$

$A \rightarrow a \mid ab \mid b \mid ASA \mid AS \mid SA$

$B \rightarrow b$

$C \rightarrow a$

$D \rightarrow b$

$E \rightarrow SA$

$S \rightarrow AE \mid CB \mid AS \mid SA \mid a$

$A \rightarrow a \mid CD \mid b \mid AE \mid AS \mid SA$

$B \rightarrow b$