

Dated:

"TQA Assignment"

K180268.
Section: A

Q1: (a) $L1 = \{a^n b^n \mid n \geq 1\}$

Ans: $S \rightarrow ab \mid aSb$

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

Ans: since m not given, let $m \geq 1$ so,

$S \rightarrow aSa \mid aBa$

$B \rightarrow b \mid bB$

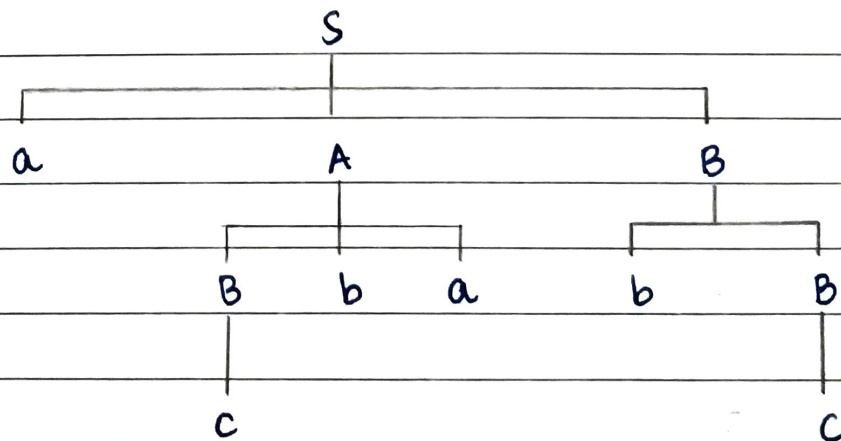
Q2: Give derivation and parse tree for word $w = acbabc$.

$S \rightarrow aAB \quad A \rightarrow Bba \quad B \rightarrow bB \mid c$

Ans: derivation:

- | | |
|--------------|--------------------------------|
| 1. aAB | $\therefore S \rightarrow aAB$ |
| 2. $abbaB$ | $\therefore A \rightarrow Bba$ |
| 3. $acbAB$ | $\therefore B \rightarrow c$ |
| 4. $acbabbB$ | $\therefore B \rightarrow bB$ |
| 5. $acbabc$ | $\therefore B \rightarrow c$ |

tree:



leaves of the tree form: $acbabc$

ated:

Q3: obtain language for:

$$S \rightarrow asb \quad S \rightarrow ab$$

Ans: $L(G) = \{ a^n b^n \mid n \geq 1 \}$

Q4: obtain left and right most derivation for: aaabbabbba

$$S \rightarrow aB \mid bA \quad A \rightarrow aS \mid AAA \mid a \quad B \rightarrow bS \mid aBB \mid b$$

Ans: left most:

- | | |
|------------------|--------------------------------|
| 1. aB | $\therefore S \rightarrow aB$ |
| 2. $aabb$ | $\therefore B \rightarrow aBB$ |
| 3. $aaabBB$ | $\therefore B \rightarrow aBB$ |
| 4. $aaabBB$ | $\therefore B \rightarrow b$ |
| 5. $aaabbb$ | $\therefore B \rightarrow b$ |
| 6. $aaabbabb$ | $\therefore B \rightarrow aBB$ |
| 7. $aaabbabb$ | $\therefore B \rightarrow b$ |
| 8. $aaabbabbs$ | $\therefore B \rightarrow bS$ |
| 9. $aaabbabbbA$ | $\therefore S \rightarrow bA$ |
| 10. $aaabbabbba$ | $\therefore A \rightarrow a$ |

right most:

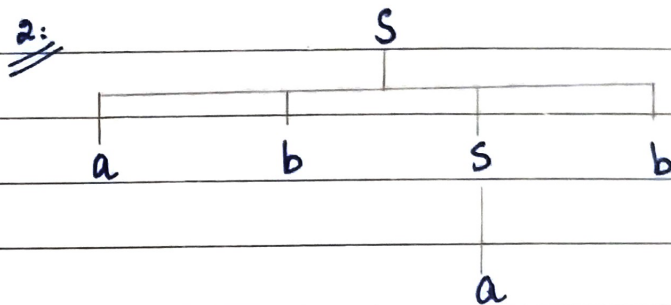
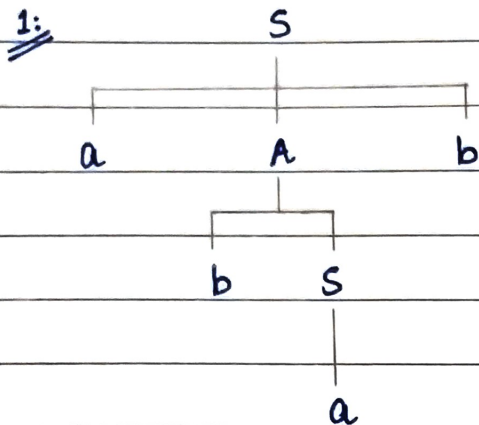
- | | |
|-------------------|--------------------------------|
| 1. aB | $\therefore S \rightarrow aB$ |
| 2. $aaBB$ | $\therefore B \rightarrow aBB$ |
| 3. $aaBbs$ | $\therefore B \rightarrow bS$ |
| 4. $aaBbbA$ | $\therefore S \rightarrow bA$ |
| 5. $aaBbbba$ | $\therefore A \rightarrow a$ |
| 6. $aaabBbbba$ | $\therefore B \rightarrow aBB$ |
| 7. $aaabBbSbba$ | $\therefore B \rightarrow bS$ |
| 8. $aaabBbaBbba$ | $\therefore S \rightarrow aB$ |
| 9. $aaabBbabbbba$ | $\therefore B \rightarrow b$ |
| 10. $aaabbabbba$ | $\therefore B \rightarrow b$ |

Dated:

Q5: $S \rightarrow a | aAb | abSb$

$A \rightarrow aAb | bS$

Ans: let string: abab



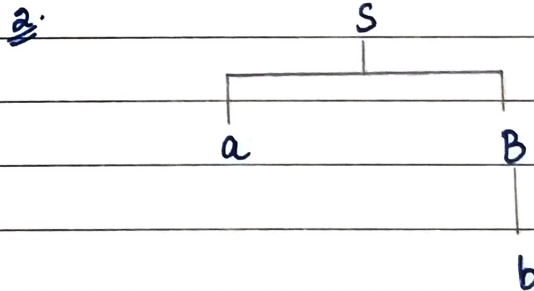
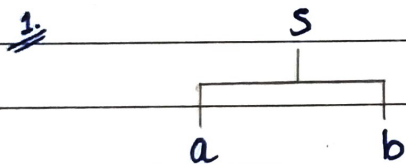
\therefore 2 derivation trees for same string
hence ambiguous.

Q6: $S \rightarrow AB | ab$

$A \rightarrow aAB | a$

$B \rightarrow ABb | b$

Ans: let string: ab



\therefore 2 derivation trees for same
string, hence ambiguous.

Q7: $S \rightarrow aAbB$

$A \rightarrow aA | a$

$B \rightarrow bB | b$

Ans: $X_1 \rightarrow a$

$S \rightarrow X_1 X_3$

$X_2 \rightarrow b$

$A \rightarrow X_1 A | a$

$X_3 \rightarrow AX_4$

$B \rightarrow X_2 B | b$

$X_4 \rightarrow X_2 B$

ated:

Q8: $S \rightarrow ASA | AB$ $A \rightarrow B | S$ $B \rightarrow b | \epsilon$

Ans: ✓ Remove Null Production: $\{A, B\}$

1. $S \rightarrow ASA | AB$ so, $S \rightarrow ASA | AB | AS | SA | S | a$

2. $A \rightarrow B | S$ $A \rightarrow B | S$

3. $B \rightarrow b$ $B \rightarrow b$

✓ Remove Unit Production:

1. $S \rightarrow S$ so, $S \rightarrow ASA | AB | AS | SA | a$

2. $A \rightarrow B$ $A \rightarrow b | a | ASA | AB | AS | SA$

3. $A \rightarrow S$ $B \rightarrow b$

✓ Apply CNF Rules:

$X_1 \rightarrow a$ so, $S \rightarrow AX_3 | X_1B | AS | SA | a$

$X_2 \rightarrow b$ $A \rightarrow b | a | AX_3 | X_1B | AS | SA$

$X_3 \rightarrow SA$ $B \rightarrow b$