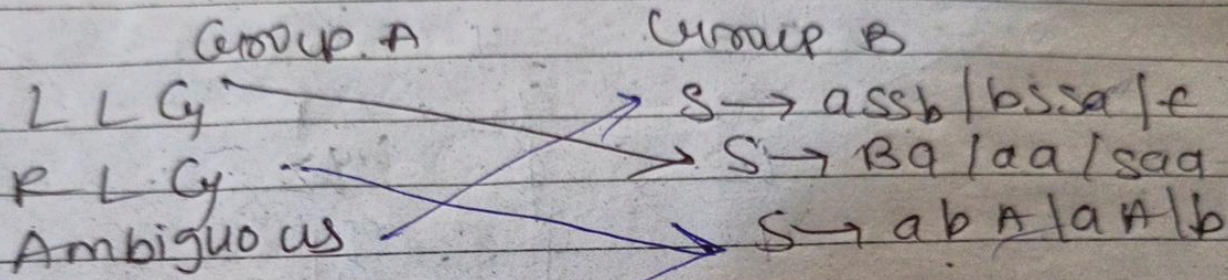


Practice sheet 3

1) Match



2) Check whether given grammar is ambiguous or not

$S \rightarrow a / sa / bss / sbS$

$S \rightarrow a$

$S \rightarrow sa$

$S \rightarrow bss$

$S \rightarrow sbS$

2) $S \rightarrow a / sa / bss / sbs$

consider string baabaa

$S \rightarrow bss$
 \downarrow
 baS
 \downarrow
 $baSbs$
 \downarrow
 $baabS$
 \downarrow
 $baabaa$

$S \rightarrow bss$
 \downarrow
 $bSaS$
 \downarrow
 baa

$S \rightarrow Sa$
 \downarrow
 $bssa$
 \downarrow
 ba

$S \rightarrow bss$
 \downarrow
 $bSaS$
 \downarrow
 $baa bss$
 \downarrow
 $baa baS$
 \downarrow
 $baa ba a$

$S \rightarrow bss$
 \downarrow
 $bSaS$
 \downarrow
 $baSbs$
 \downarrow
 $baabSa$
 \downarrow
 $baabaa$

\therefore It is ambiguous

que 3) reduce the grammar & find equivalent grammar.

$$S \rightarrow aA / aBB$$

$$A \rightarrow aaA / \epsilon$$

$$B \rightarrow bB / bBC$$

$$C \rightarrow B$$

\Rightarrow

~~As all are reachable and then all are generating any string.~~

~~remove B & C, because they are useless prodⁿ.~~

$$S \rightarrow aA / aBB$$

$$A \rightarrow aaA / \epsilon$$

~~remove aBB from S as they are useless symbol~~

$$S \rightarrow aA/a$$

remove

⇒ remove B&C, because they are useless prodn

$$S \rightarrow aA/aBB$$

$$A \rightarrow aaA/\epsilon$$

remove aBB from S as they are useless symbol

$$S \rightarrow aA$$

$$A \rightarrow aaA/\epsilon$$

2] remove ϵ

$$A \rightarrow \epsilon$$

$$S \rightarrow aA$$

$$\downarrow$$

$$\epsilon$$

$$S \rightarrow a\epsilon$$

$$S \rightarrow a$$

$$S \rightarrow aA/a$$

$$A \rightarrow aaA$$

$$\downarrow$$

$$\epsilon$$

$$A \rightarrow aa$$

$$A \rightarrow aaA/aa$$

after removing the production

$S \rightarrow aAb$
 $A \rightarrow aAb / aq$

3) remove unit production
No unit production

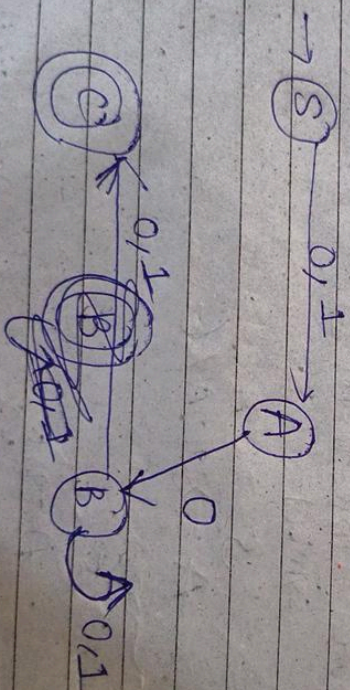
final grammar, $S \rightarrow aAb / aq$
 $A \rightarrow aAb / aq$

ques) $LLG \rightarrow FLG$

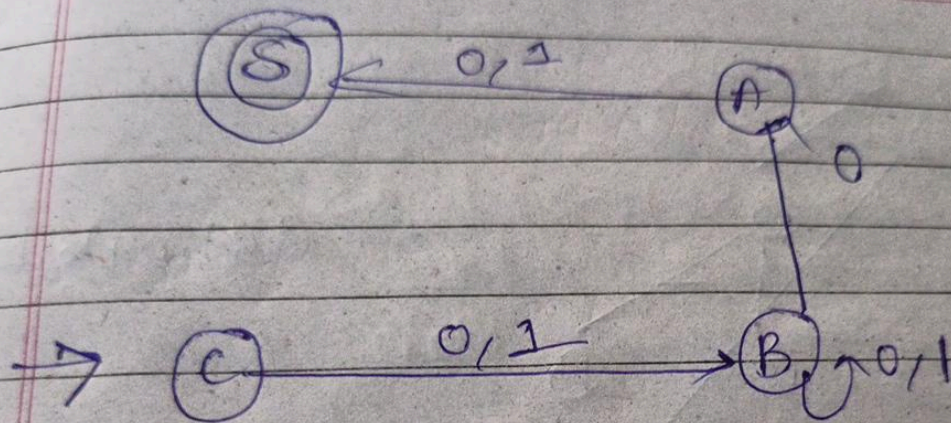
$S \rightarrow AB \mid A^2$

$A \rightarrow B^2$

$B \rightarrow BA \mid B \mid 1$



e



$C \rightarrow 0B \mid 1B$
 $B \rightarrow 0B \mid 1B \mid 0A$
 $A \rightarrow 0A \mid 1A$
 $S \rightarrow \epsilon$

Que 6) String "aabbba"

Q6)

string = "aabbabbaa"

$S \rightarrow aB/bA$

$A \rightarrow aS/bAA/a$

$B \rightarrow bS/aBB/b$

Left

$w \rightarrow aS$

$\rightarrow qaB$

$\rightarrow aabS$

$\rightarrow aabbA$

$\rightarrow aabbas$

$\rightarrow aabbabA$

$\rightarrow aabbabbaA$

$\rightarrow aabbabbaa$

$\rightarrow aabbabbaA$

$\rightarrow aabbabbaa$

Right

$w \rightarrow aS$

$\rightarrow aab$

$\rightarrow aabS$

$\rightarrow aabbA$

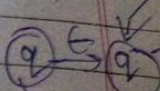
$\rightarrow aabbas$

$\rightarrow aabbabA$

$\rightarrow aabbabbaA$

$\rightarrow aabbabbaa$

$\rightarrow aabbabbaa$



Ques 11) Convert the grammar into Chomsky Normal form

Normal form

$S \rightarrow ABg$

$A \rightarrow aab$

$B \rightarrow Ab$

Instead of terminals put variables

$X \rightarrow a$

$S \rightarrow ABX$

$A \rightarrow xxb$

$B \rightarrow Ab$

$Y \rightarrow b$

$S \rightarrow ABX$

$A \rightarrow xxy$

$B \rightarrow Ay$

$X \rightarrow q, Y \rightarrow b$

as it contains only two non-terminals, so remove it.

$Z \rightarrow AB$

$P \rightarrow \cancel{AB} \cancel{XX}$

$S \rightarrow ZX$

$A \rightarrow \cancel{AB} PY$

$B \rightarrow AY$

$X \rightarrow q$

$Y \rightarrow b$

$Z \rightarrow AB$

$P \rightarrow \cancel{XX}$

CNF

Ques 10) Convert the grammar into CNF:

$S \rightarrow AB$
 $A \rightarrow aab$
 $B \rightarrow AC$

\Rightarrow replace $X \rightarrow a$
instead of terminals put variables

$S \rightarrow ABX$
 $A \rightarrow XXb$
 $B \rightarrow AC$
 $X \rightarrow a$

as rule says, it does not generate
more than 2 non-terminals
So remove it.

$Y \rightarrow AB$
 $Z \rightarrow XX$

$S \rightarrow YZ$
 $A \rightarrow zb$
 $B \rightarrow AC$
 $X \rightarrow a$
 $Y \rightarrow AB$
 $Z \rightarrow XX$

Ques 11) replace $P \rightarrow b$ as a
it does not allowed one ~~any~~ variable
and ~~any~~ turning

$S \rightarrow YZ$
 $A \rightarrow ZP$
 $B \rightarrow AC$
 $X \rightarrow a$
 $Y \rightarrow AB$
 $Z \rightarrow XX$
 $P \rightarrow b$

} CNF