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SLOT: $C_2 + TC_2$

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CAT-II CSI1003

1).

$S \to XY \mid W$

$X \to aXb \mid \varepsilon$

$Y \to cY \mid \varepsilon$

$W \to aWc \mid Z$

$Z \to bZ \mid \varepsilon$

Simplication:-

1) Useless production: (removal)

* No useless production

2) Null production (removal)

$S \to XY \mid (W) \mid (Y) \mid (\varepsilon)$

$X \to aXb \mid ab$

$Y \to cY \mid$

$W \to aWc \mid ac \mid (Z)$

$Z \to bZ \mid b$

3) Unit production (removal):-

$S \to (XY) \mid aWc \mid ac \mid bZ \mid b \mid cY \mid aXb \mid ab$

$X \to aXb \mid ab$

$Y \to cY$

$W \to aWc \mid ac \mid bZ \mid (b)$

$Z \to bZ \mid (b)$

$S \to XY,\ W \to b \ \&\ Z \to b,\ S \to bZ \mid b$

already in CNF

$S \to aWc \mid ac \mid cY \mid aXb \mid ab$

$X \to aXb \mid ab$

$C \to cY$

$W \to aWc \mid ac \mid bZ$

$Z \to bZ$

~~$S \to aWE \mid aE \mid aXF \mid aF$~~

~~$X \to aX$~~

$S \to aWE \mid aE \mid aXF \mid aF$

$X \to aXF \mid aF$

$W \to aWE \mid aE \mid$

$S \to aS_1 \mid aE \mid aS_2 \mid aF$, $S_1 \to WE$

$X \to aS_3 \mid aF$, $S_2 \to XF$

$W \to aS_1 \mid aE$, $S_3 \to XF$

The CNF are

$S \to XY$, $W \to b$, $Z \to b$, $S \to bZ \mid b$

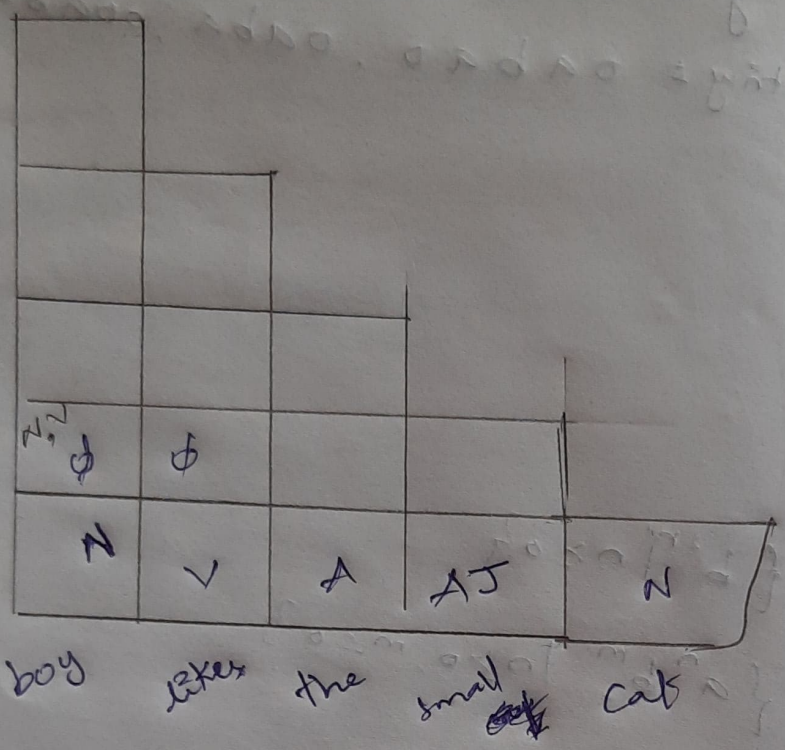
$S \to CY$

$C \to CY$

$W \to bZ$

$Z \to bZ$

2) string = boy / likes / the / small / cat
N V A AJ N



$$(x_{i,j}) = (x_{i,i}, x_{i+1,j}) \cup (x_{i,i+1}, x_{i+2,j}) \cup (x_{i,i+2}, x_{i+3,j}) \cup (x_{i,j-1}, x_{j,j})$$

3). $L(G) = \{ 0^n w w^r 0^n \mid n \geq 0, w \in \{a,b\}^* \}$

valid string = 0aa0 , 0abab0 , abababa

invalid string = 0aba0 , 0aba , 00aba000

4).

$L_1 = \{ b^{2n} \mid n \geq 0 \}$.

$L_2 = \{ a^n b^m \mid n \geq 0, m \geq 0 \}$

L_1 ~~is~~ → regular language

L_2 → regular language

Then $L_1 \cup L_2$ must also be a regular language.

L_1 has regular expression of $(bb)^*$

L_2 has regular expression of $(a^* b^*)$

So $L_1 \cup L_2$ has regular expression of

$(bb)^* + (a^* b^*)$

The Regular language only have regular expression. If it has regular expression. Hence it is a regular language