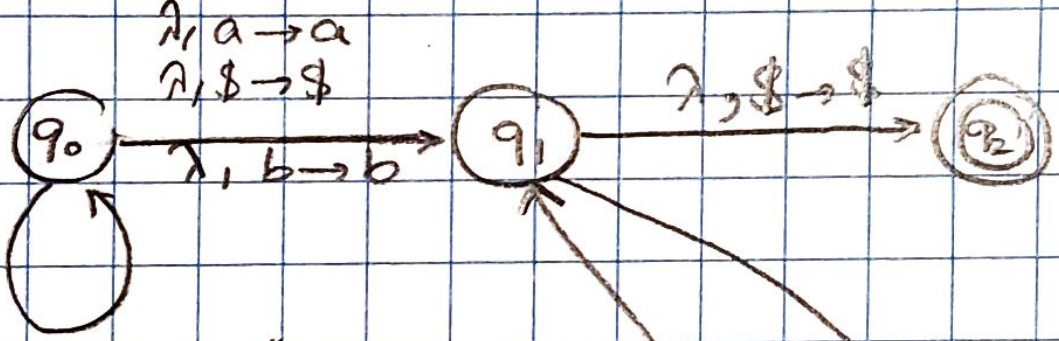
$L = \{ ww^r \mid w \in \{a,b\}^* \}$ (1)

$P \rightarrow aPa \mid bPb \mid \lambda$



$a, \$ \rightarrow a\$$ $\quad b, a \rightarrow ba$

$a, a \rightarrow aa$ $\quad b, b \rightarrow bb$

$a, b \rightarrow ab$ $\quad b, \$ \rightarrow b\$$

$a, a \rightarrow \lambda$

$b, b \rightarrow \lambda$

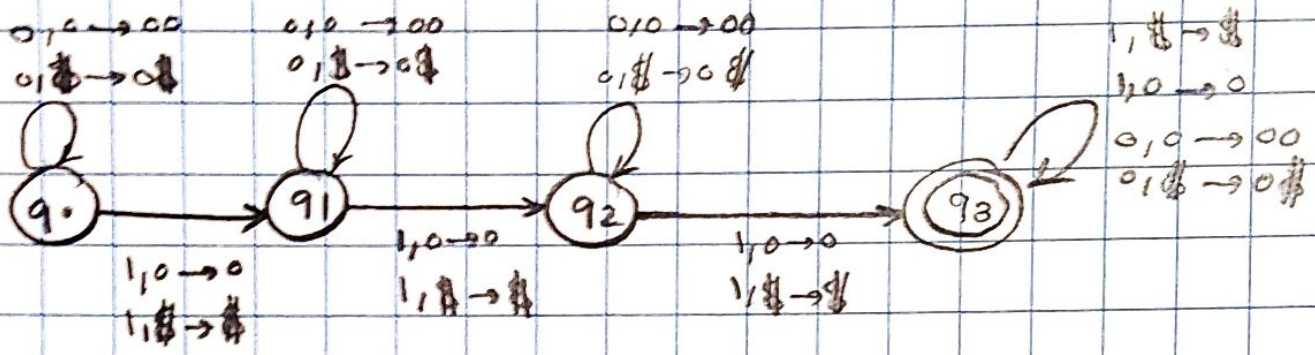
CFL closed under interseection? (F)

$L_1 = a^m b^n c^n \longrightarrow$ CFL ✓

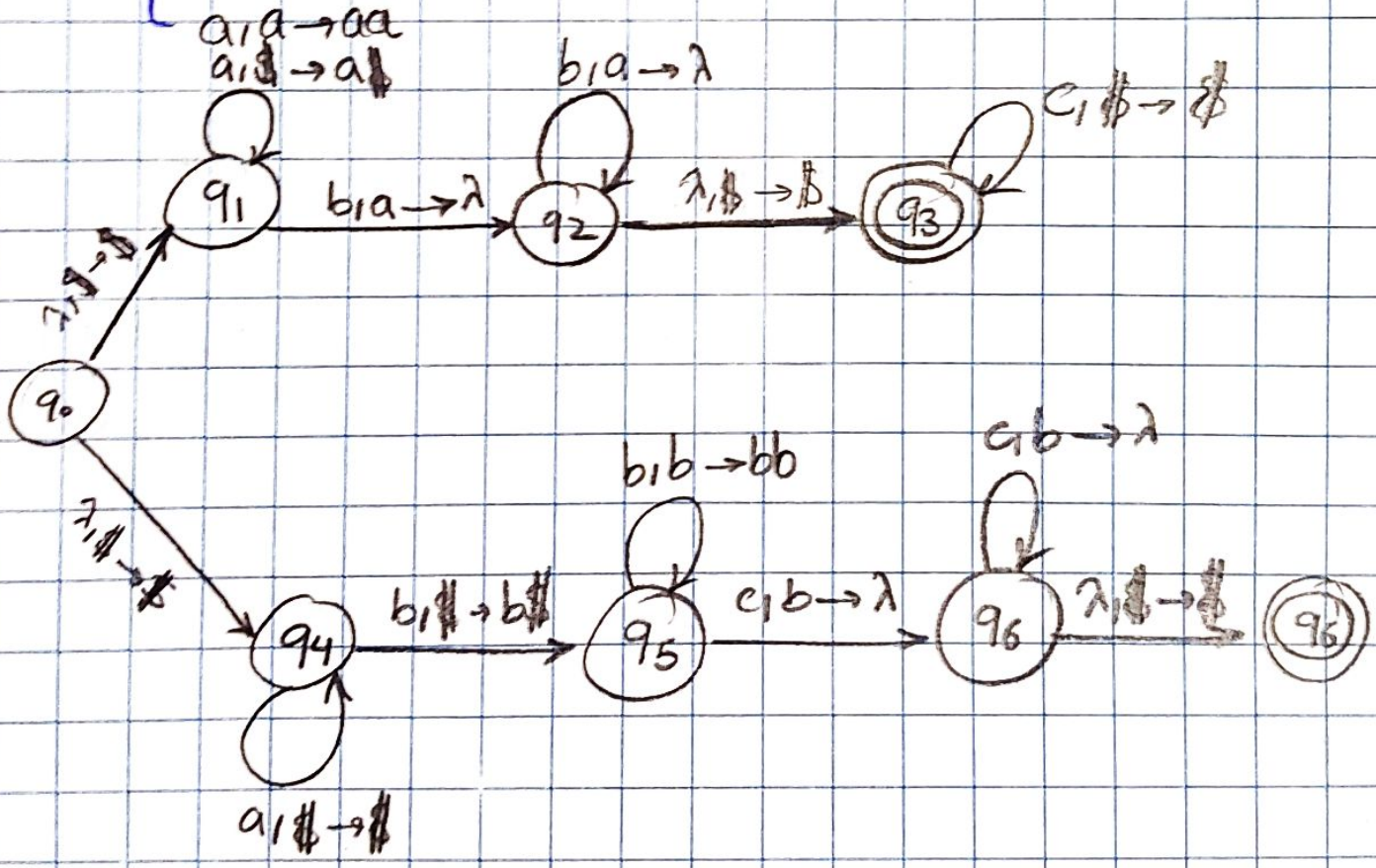
$L_2 = a^n b^n C^m \longrightarrow$ CFL ✓

$\cap \rightarrow L_1 \cap L_2 = a^n b^n c^n \Rightarrow$ not CLF

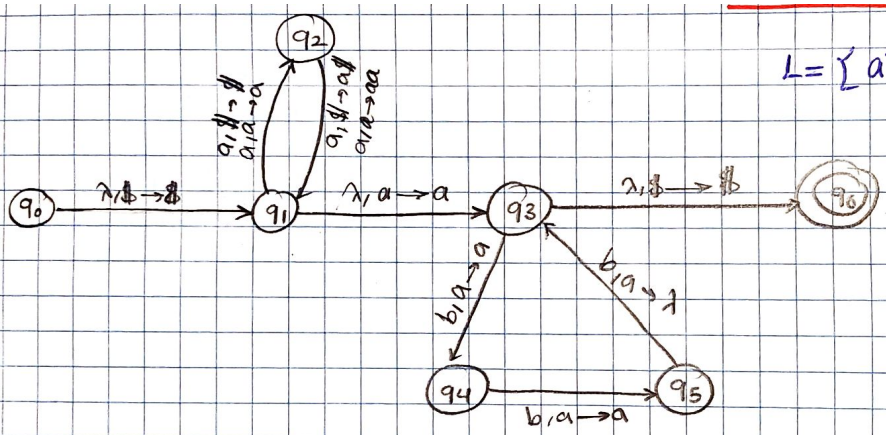
$A = \{ w \in \{0,1\}^* \mid w \text{ contains atleast three 1s} \}$ (٢)



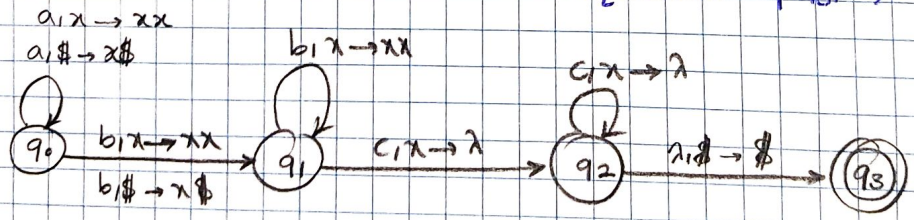
$L = \{ a^i b^j c^k \mid i,j,k \geq 0 \text{ and } i = j \text{ or } j = k \}$ (٣)

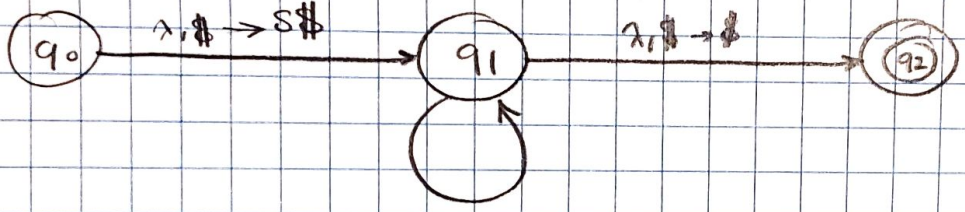


$L = \{ a^{2n} b^{3n} \mid n \geq 0 \}$ (3)



$L = \{ a^i b^j c^k \mid i,j,k \geq 0 \text{ and } i+j=k \}$ (4)





$\lambda, \delta \rightarrow aTXb$

$\lambda, X \rightarrow a$

$\lambda, X \rightarrow b$

$\lambda, T \rightarrow XTS$

$\lambda, T \rightarrow \lambda$

$a, a \rightarrow \lambda$

$b, b \rightarrow \lambda$

$S \rightarrow aTXb$ (V)

$T \rightarrow XTS \mid \lambda$

$X \rightarrow a \mid b$