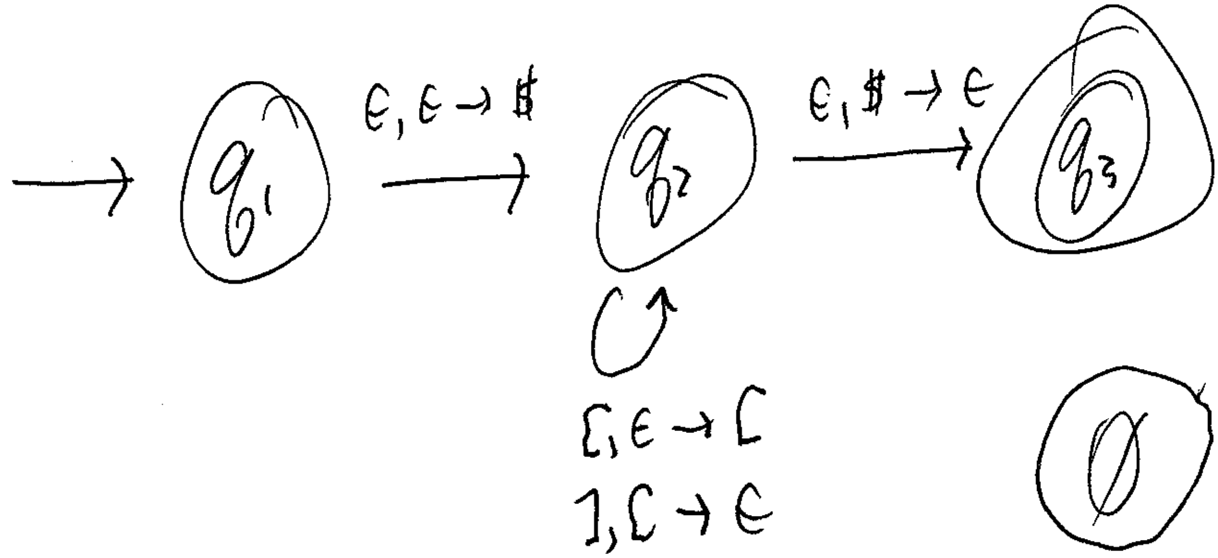
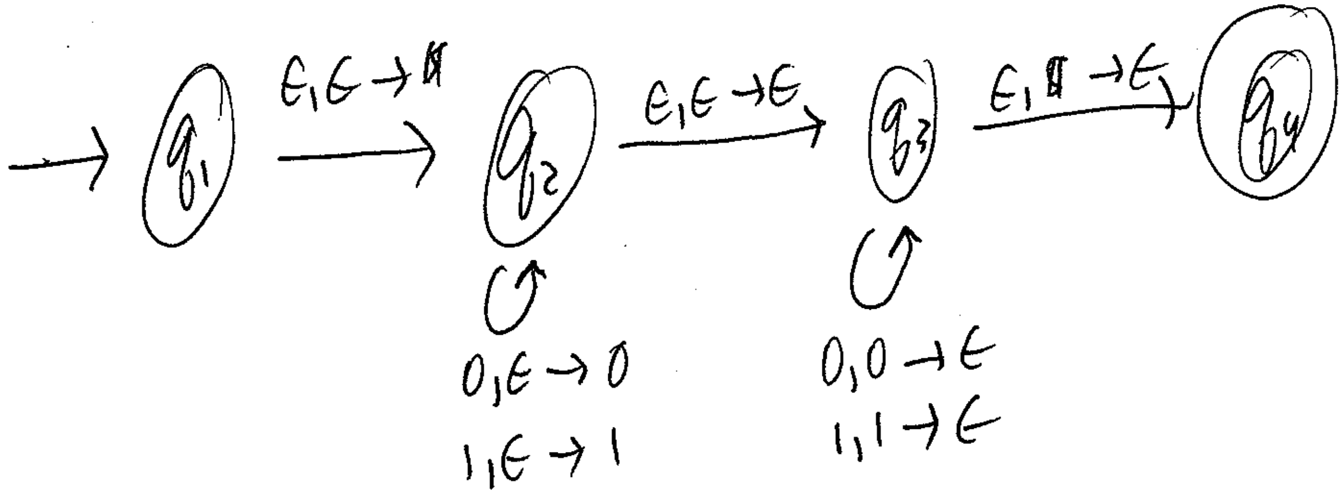


$$\delta(q_1, \epsilon, \epsilon) \to (q_2, \$)$$
$$\delta(q_2, [, \epsilon) \to (q_2, [)$$
$$\delta(q_2,], [) \to (q_2, \epsilon)$$
$$\delta(q_2, \epsilon, \$) \to (q_3, \epsilon)$$
all other transitions $\to \emptyset$

q_1	[]	$\sqcup$
q_2	[]	$\$$
q_2	]	[$\$$
q_2	ϵ	$\$$
q_3	ϵ	$\sqcup$



Union of 2 CFGs

$$G_1 = (V_1, \Sigma, R_1, S_1)$$

$$G_2 = (V_2, \Sigma, R_2, S_2)$$

Need to construct G to be the union of G_1 and G_2

$$G = (V_1 \cup V_2 \cup S, \Sigma, R_1 \cup R_2 \cup S \to S_1 | S_2, S)$$

variables in each grammar must be unique

*

Preprocess G_1 and G_2 as follows:

1) subscript all variables in G_1 with 1
2) subscript all variables in G_2 with 2
3) change rules to use new subscripted variables in both G_1 and G_2

Concatenation of G_1 and G_2

$$G = (V_1 \cup V_2 \cup S,\ \Sigma,\ R_1 \cup R_2 \cup S \rightarrow S_1 S_2,\ S)$$

$A = a^i b^i c^j$

$B = a^k b^m c^m$

$A \cap B = a^n b^n c^n$

By using the pumping lemma, we can prove that $A \cap B$ is not a CFL