Lecture 4

Epsilon (ε) – NFA

- $\varepsilon \rightarrow$ empty symbols

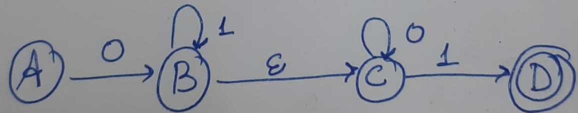
  ↳ $\{Q, \Sigma, q_0, F, \delta\}$

  (δ): only this is different.

  $Q \times \Sigma \cup \varepsilon \rightarrow 2^Q$

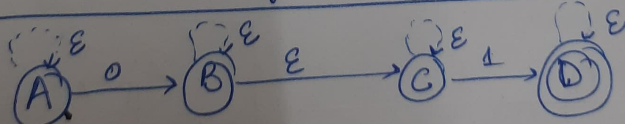
  (ε): State on seeing nothing or empty symbol can go to 2^Q.

eg:-



: ε-NFA

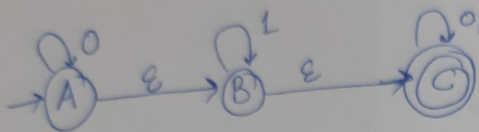
** $\boxed{\text{Every state on } \varepsilon \text{ goes to itself}}$



Faculty name

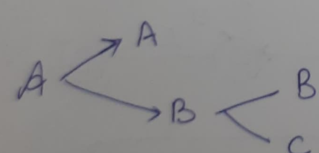
Name: Priyanshu Bharat

Conversion of ε-NFA ⟶ NFA :



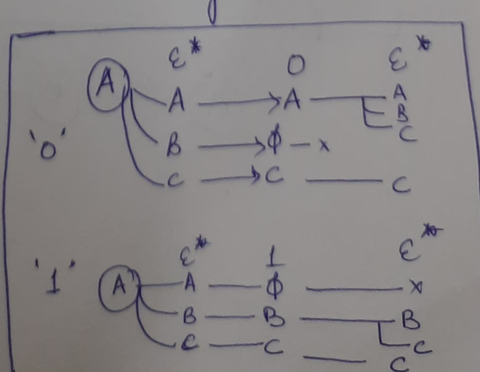
Rule : (i) for each state that we have, check where this state goes on ε^* and so on.

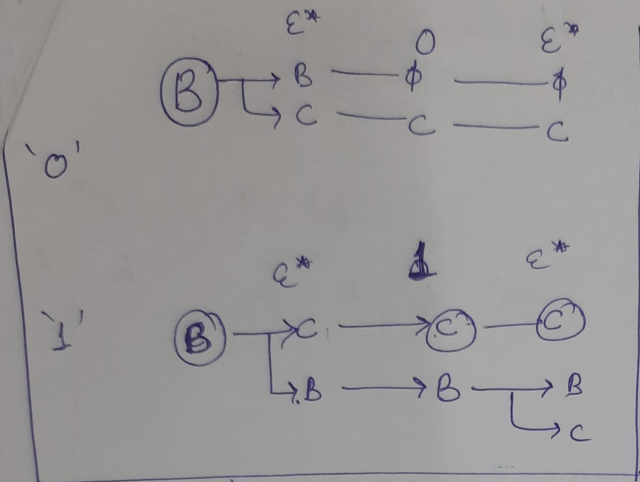
⟶ All the states that can be reached from a particular state only by seeing the ε symbol.

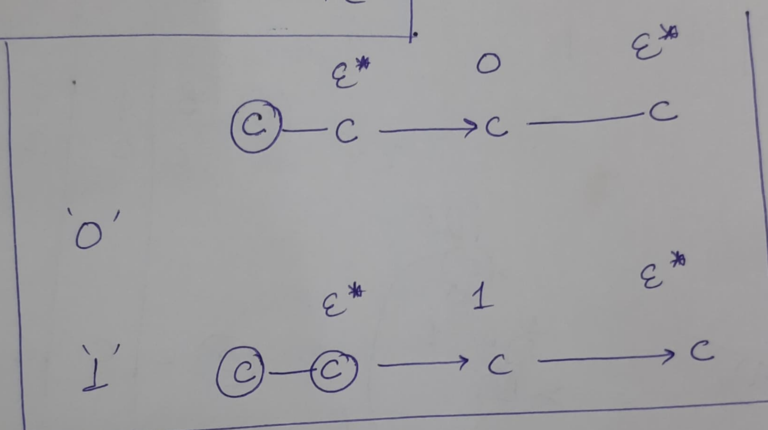


$\therefore A \to B \to C \quad \therefore (\varepsilon^* \text{ of } A) = ABC$

Q \ Σ	0	1
→ A	{A, B, C}	{B, C}
B	C	{B,C}
(C)	C	C

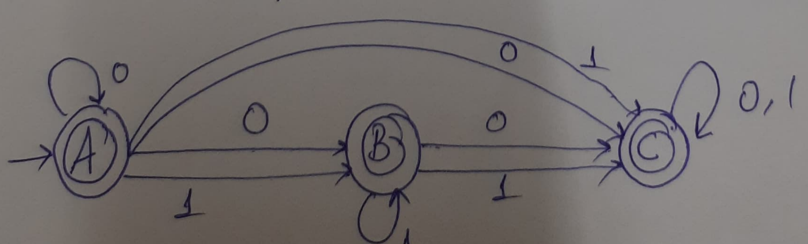




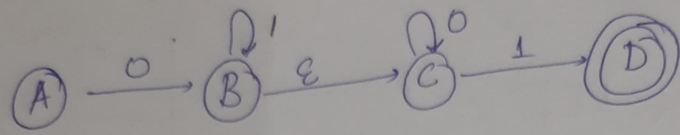


** Final state will be any state that can reach the final state only by seeing ε.

$\therefore$ A, B & C are all final state.



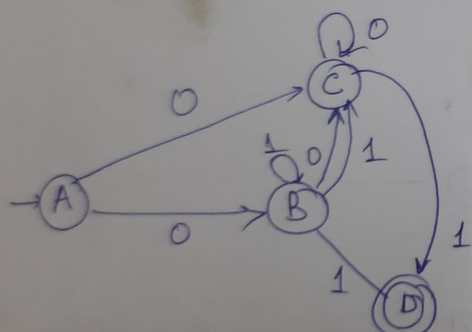
Eg2 :



	0	1
→A	B, C	ϕ
B	C	B, C, D
C	C	D
D	ϕ	ϕ

	ε*	0	ε*
A	A	B	B C
B	B C	ϕ C	ϕ C
C	C	C	C
D	D	ϕ	ϕ

ε*	1	ε
A	A	ϕ
B C	B D	B C D
C	D	D
D	ϕ	ϕ



(3)

$$q_3 = \underset{\substack{\downarrow \\ eq(v)}}{q_2}\, a$$

$$\Rightarrow \underset{\substack{\downarrow \\ eq(vi)}}{\underline{q_1}}\, a(b+ab)^* a$$

$$\boxed{q_3 \Rightarrow (a+a(b+ab)^* b)^* a(b+ab)^* a}$$

Now all are in input a,b ∴ it is RE.