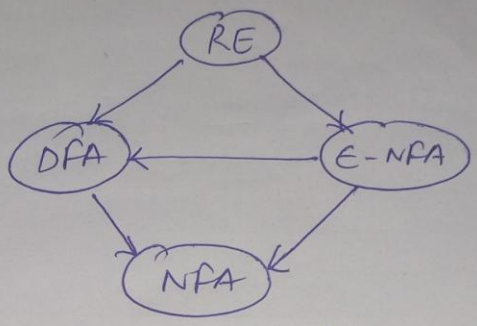
Relation between FA and RE (6)

- DFA, NFA, ϵ-NFA and RE are all related.
-



→ RE → ϵ NFA → DFA

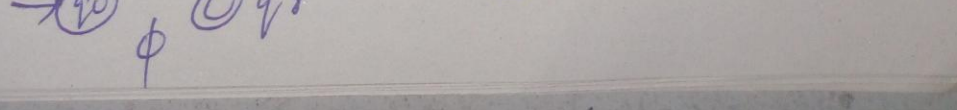
→ ~~ϵ-NFA → N~~

- language accepted by a DFA is regular.
- DFA comes from NFA | ϵ-NFA lang of them is also regular.

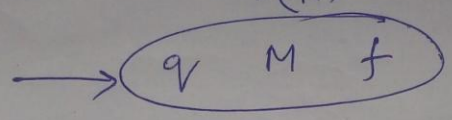
Obtain ϵ-NFA from a RE

Theorem Let R be a RE. Then there exist a FA $M = (Q, \Sigma, \delta, q_0, F)$ which accepts $L(R)$.

Proof ϕ, ϵ, a are RE.

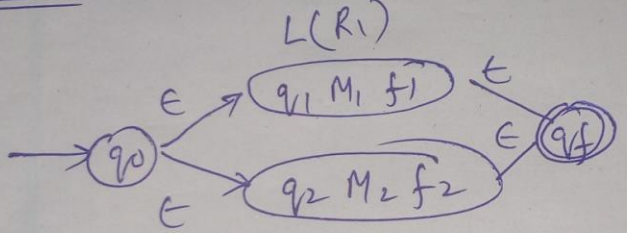


(1) The schematic representation of a RE R to accept the lang L(R) is



(2) If R and S are RE, then R+S, R.S, R^* are also RE.

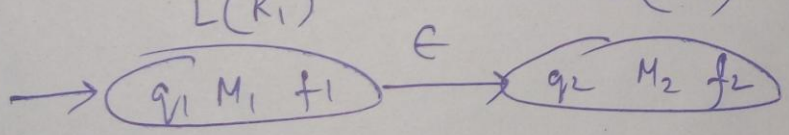
Case I $R = R_1 + R_2$



to accept $L(R_1 + R_2)$

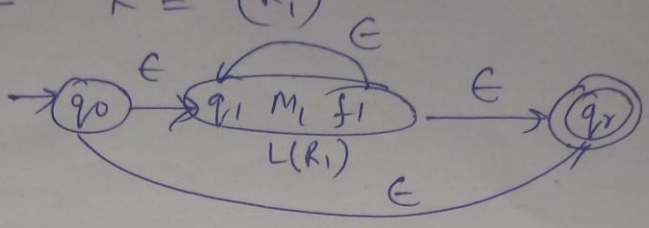
Case II

$R = R_1 \cdot R_2$



$L(R_1 \cdot R_2)$

Case III $R = (R_1)^*$

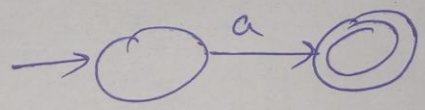


accept $L(R_1)^*$

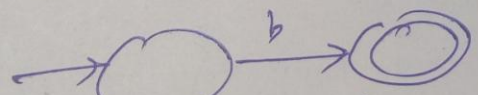
Ex: Obtain an NFA which accepts strings of a's and b's starting with string ab. ab $(a+b)^*$

Sol

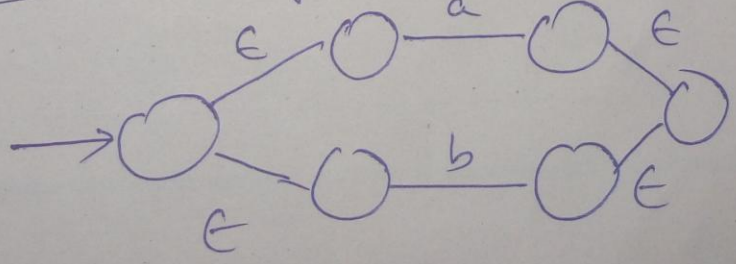
Step 1 accept ab.



Step 2 accept b

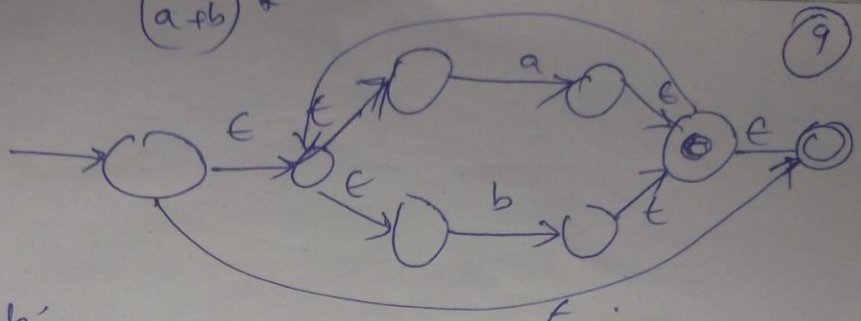


Step 3 accept $(a+b)$

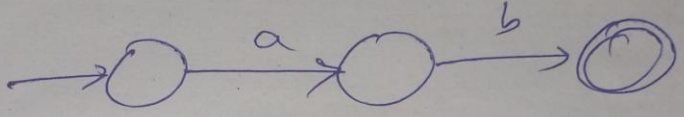


step 4

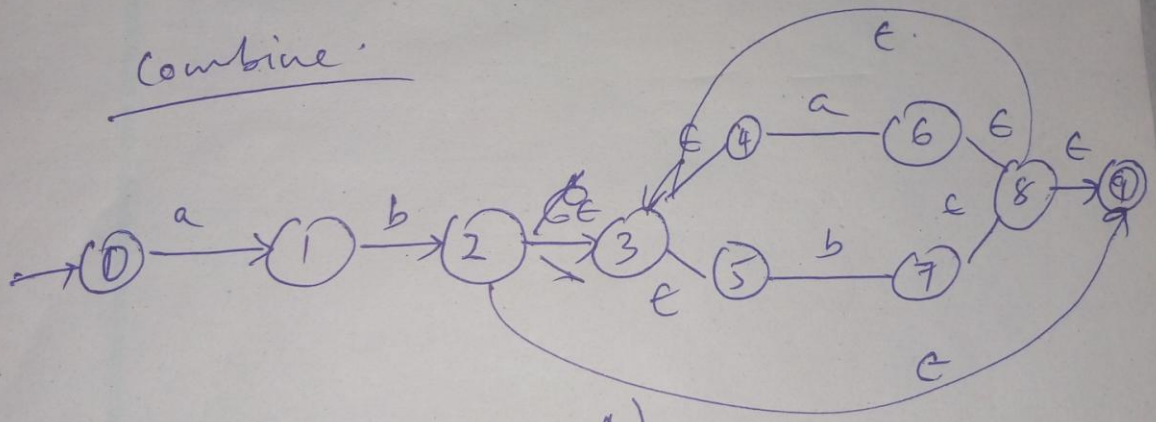
$(a+b)^*$



step ab.



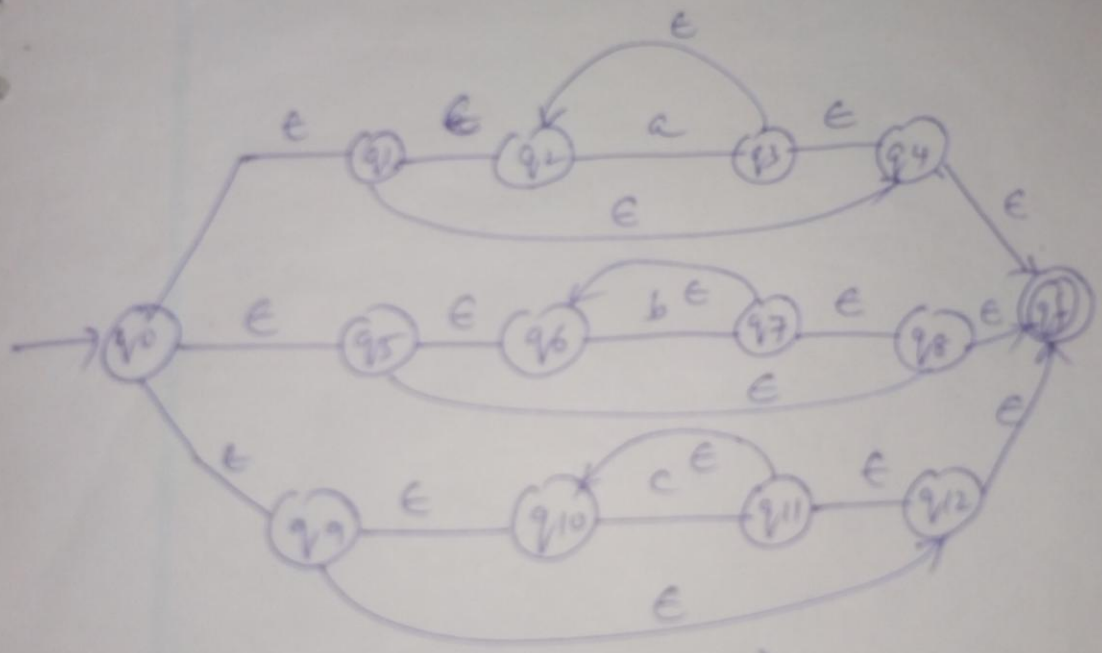
combine.



$L(ab(a+b)^*)$

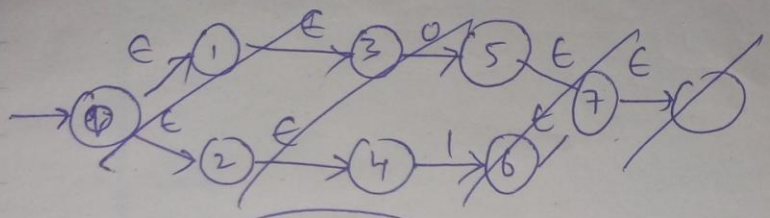
NFA for RE $a^* + b^* + c^*$

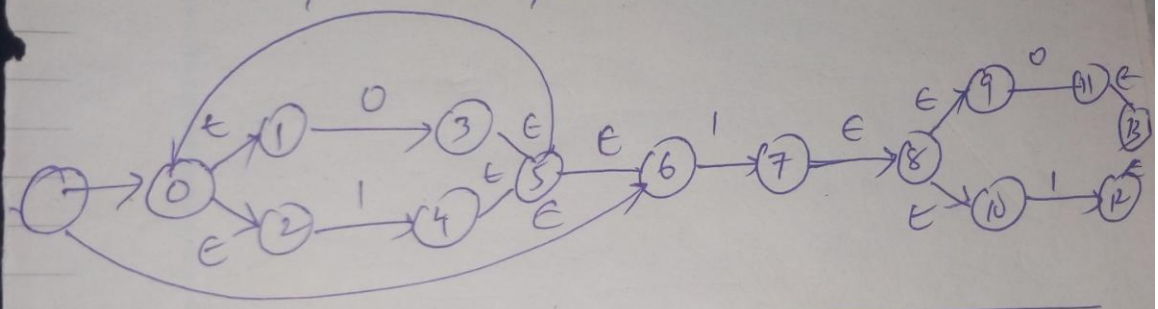
Sol: make for one. a^*

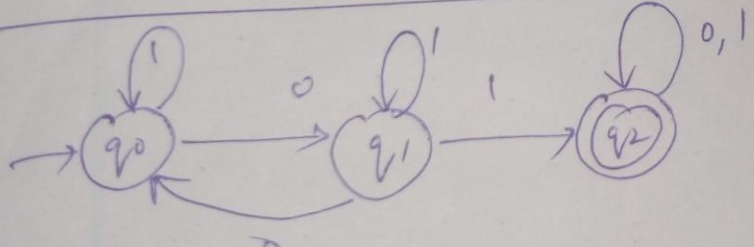


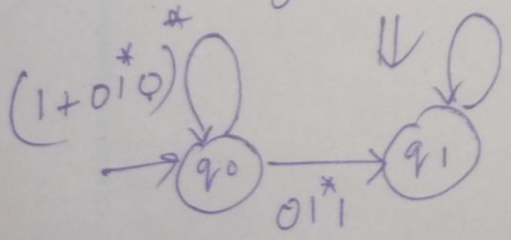
$L(a^* + b^* + c^*)$

RE $(0+1)^* \cdot 1 \cdot (0+1)$ → ∈ NFA









0+1

$(1+01^*0)^* 01^*1 (0+1)^*$