① Regular Expressions:

Date: 03.10.2020.

Prove that there exists a finite automation $M = (Q, \Sigma, \delta, q_0, F)$ to accept the Language $L(R)$ corresponding to the regular expression

OR

Let R be a regular expression. Then there exists a finite automation $M = (Q, \Sigma, \delta, q_0, F)$ which accepts $L(R)$.

OR.

Prove that every language defined by a regular expression is also defined by finite automation.

OR.

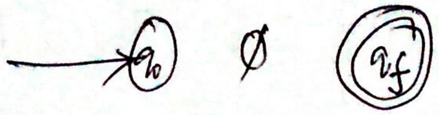
Explain the detailed procedure to convert/write finite automata for a given expression.

OR

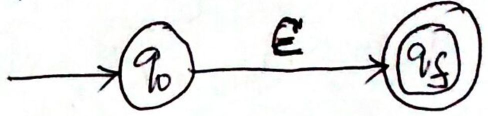
(KLEENE'S THEOREM (Part-1)) Solution ...

Proof: By the formal definition of regular expression:

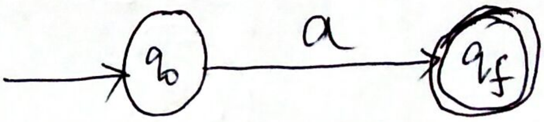
i) ϕ is regular expression → Corresponding FA,



ii) ϵ is regular expression:
Corresponding FA is

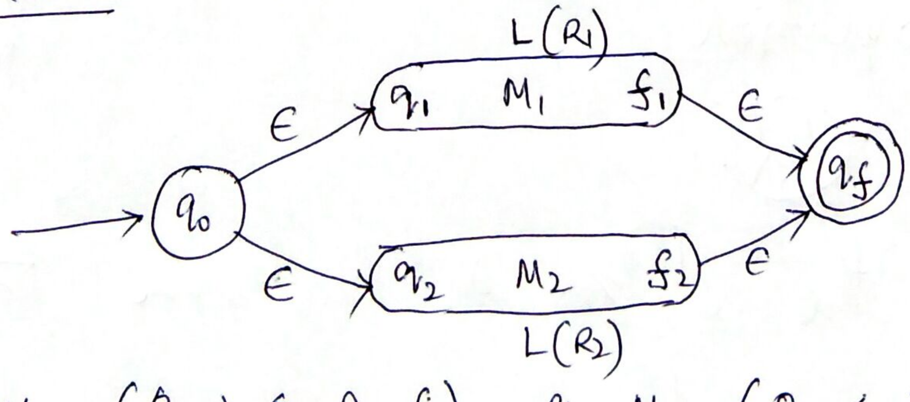


iii) Any input symbol $a \in \Sigma$ is regular expression:
Corresponding FA is



iv) If R_1 and R_2 are two regular expressions then

Case 1 • $R_1 + R_2$ is also RE



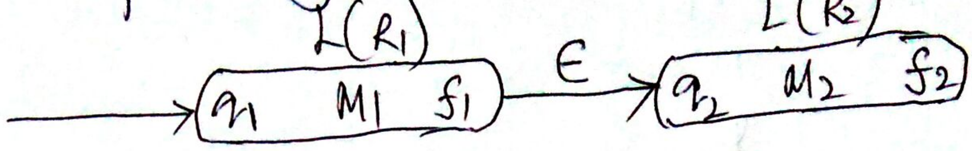
$M_1 = (Q_1, \Sigma_1, \delta_1, q_1, f_1)$ & $M_2 = (Q_2, \Sigma_2, \delta_2, q_2, f_2)$

$L(R_1)$: language accepted by M_1, $L(R_2)$: Language accepted by M_2.

q_0 is Start State & q_f is overall final State.

Case ii: $R_1 \cdot R_2$ is also RE (Concatenation)

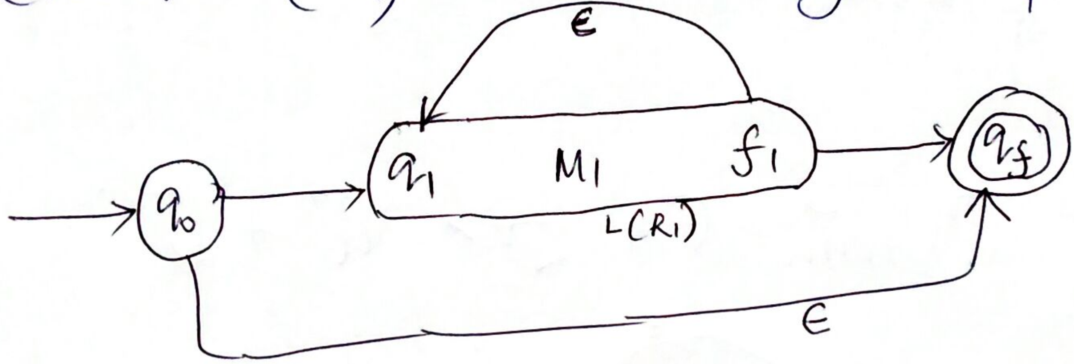
Corresponding FA is



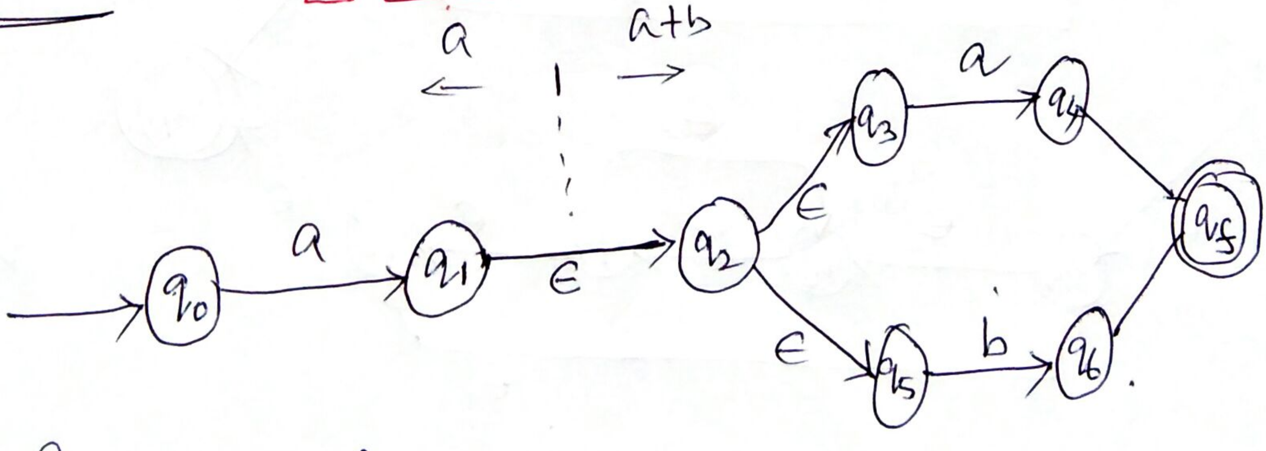
q_1 is overall Start State

f_2 — " — final State.

Case iii: $(R_1)^*$ is also Regular expression.



Ex: $\underbrace{a} \cdot \underbrace{(a+b)}$



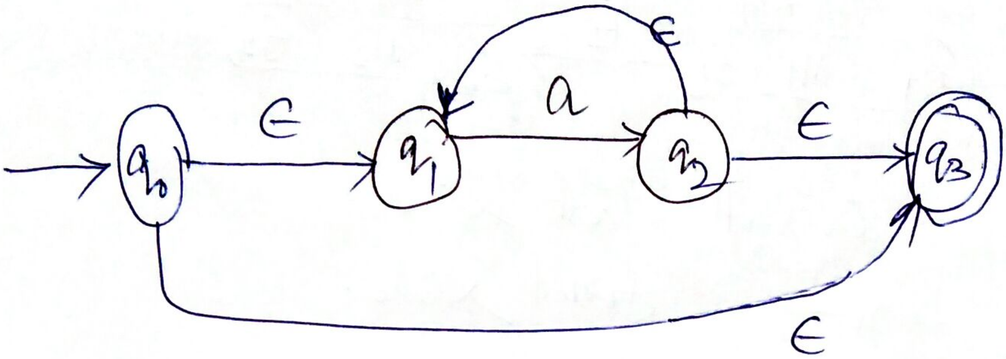
L is finite

$L = \{ aa, ab \}$

4

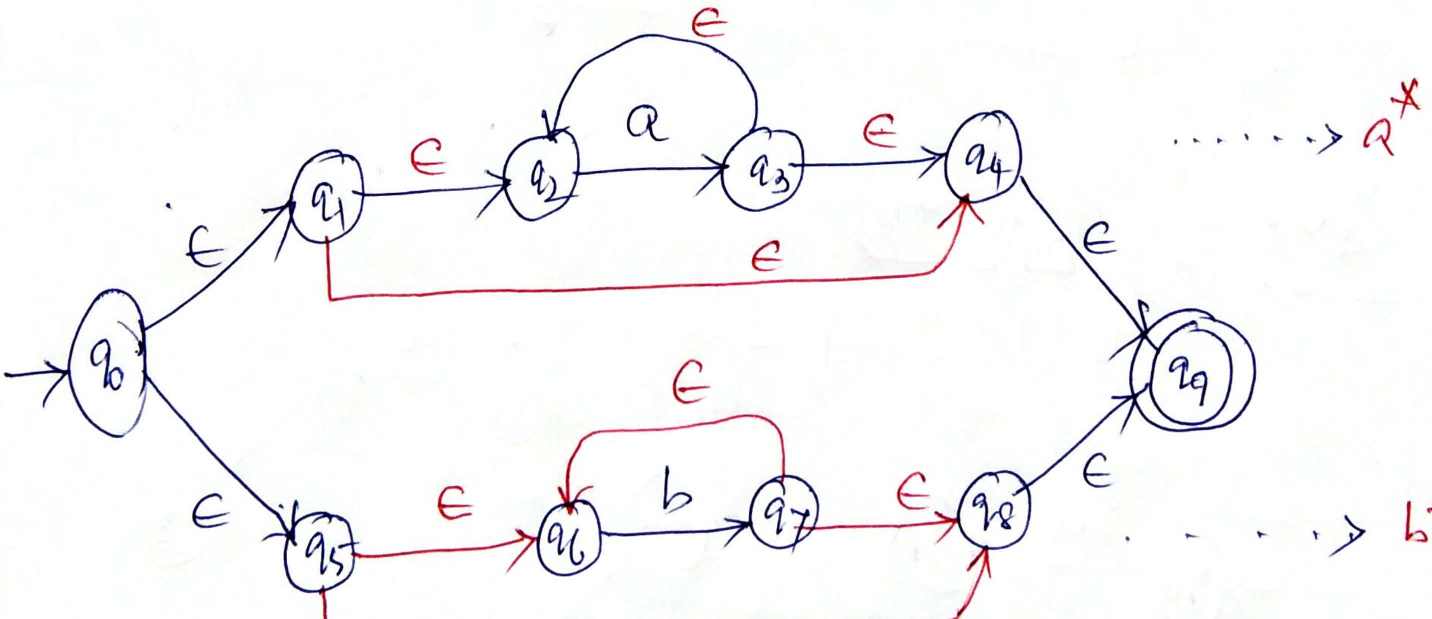
Ex2: Obtain ~~RE~~ FA for the following RE

$$a^*$$



$L = \{\epsilon, a, a^2, a^3 \ldots\ldots\}$ infinite.

Ex 3: Obtain FA for $a^* + b^*$.



$L = \{\epsilon, a, b, a^n, b^n.]$