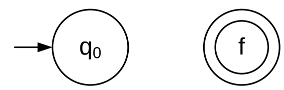
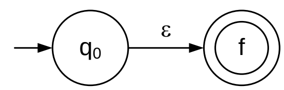
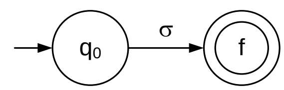
2.4. EQUIVALENCIAS

2.4.1. ER ⇒ AFN-ε

Tabla 2.2. Construcción de Thompson.

ER	**AFN-ε**
$\varnothing$	
ε	
$\sigma \in \Sigma$	

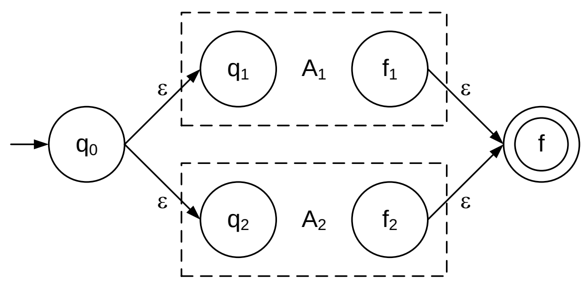
ER

$r_1 + r_2$

$A_1 = (Q_1, \Sigma_1, \delta_1, q_1, \{f_1\})$
$A_2 = (Q_2, \Sigma_2, \delta_2, q_2, \{f_2\})$

$L(A_1) = L(r_1)$
$L(A_2) = L(r_2)$

AFN-ε



$$A = (Q, \Sigma, \delta, q_0, F) \text{ donde } \begin{cases} Q = Q_1 \cup Q_2 \cup \{q_0, f\} \\ \Sigma = \Sigma_1 \cup \Sigma_2 \\ \delta \begin{cases} \delta(q_0, \varepsilon) = \{q_1, q_2\} \\ \delta(q, \sigma) = \delta_1(q, \sigma) & \forall q \in (Q_1 - \{f_1\}), \sigma \in (\Sigma_1 \cup \{\varepsilon\}) \\ \delta(q, \sigma) = \delta_2(q, \sigma) & \forall q \in (Q_2 - \{f_2\}), \sigma \in (\Sigma_2 \cup \{\varepsilon\}) \\ \delta(f_1, \varepsilon) = \{f\} \\ \delta(f_2, \varepsilon) = \{f\} \end{cases} \\ F = \{f\} \end{cases}$$

$L(A) = L(A_1) \cup L(A_2)$
$L(A) = L(r_1) \cup L(r_2)$

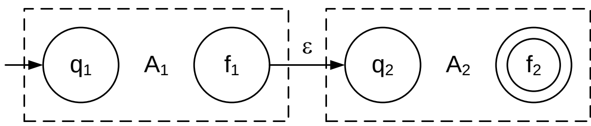
ER

r_1r_2

$A_1 = (Q_1, \Sigma_1, \delta_1, q_1, \{f_1\})$
$A_2 = (Q_2, \Sigma_2, \delta_2, q_2, \{f_2\})$

$L(A_1) = L(r_1)$
$L(A_2) = L(r_2)$

AFN-ε



$$A = (Q, \Sigma, \delta, q_0, F) \text{ donde } \begin{cases} Q = Q_1 \cup Q_2 \\ \Sigma = \Sigma_1 \cup \Sigma_2 \\ \delta \begin{cases} \delta(q,\sigma) = \delta_1(q,\sigma) & \forall q \in (Q_1 - \{f_1\}), \sigma \in (\Sigma_1 \cup \{\varepsilon\}) \\ \delta(f_1, \varepsilon) = \{q_2\} \\ \delta(q,\sigma) = \delta_2(q,\sigma) & \forall q \in Q_2, \sigma \in (\Sigma_2 \cup \{\varepsilon\}) \end{cases} \\ q_0 = q_1 \\ F = \{f_2\} \end{cases}$$

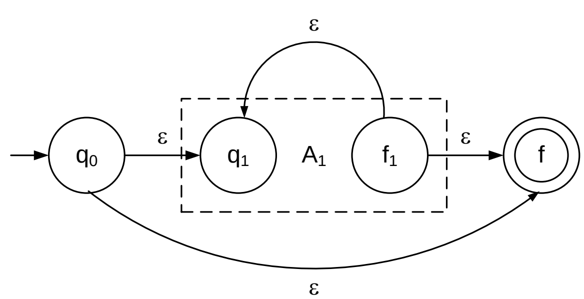
$L(A) = L(A_1)L(A_2)$
$L(A) = L(r_1)L(r_2)$

ER
r_1^*

$A_1 = (Q_1, \Sigma_1, \delta_1, q_1, \{f_1\})$

$L(A_1) = L(r_1)$

AFN-ε



$$A = (Q, \Sigma, \delta, q_0, F) \text{ donde } \begin{cases} Q = Q_1 \cup \{q_0, f\} \\ \Sigma = \Sigma_1 \\ \delta \begin{cases} \delta(q_0, \varepsilon) = \{q_1, f\} \\ \delta(q, \sigma) = \delta_1(q, \sigma) \quad \forall q \in (Q_1 - \{f_1\}), \sigma \in (\Sigma_1 \cup \{\varepsilon\}) \\ \delta(f_1, \varepsilon) = \{q_1, f\} \end{cases} \\ F = \{f\} \end{cases}$$

$L(A) = L(A_1)^*$
$L(A) = L(r_1)^*$

Ejemplo:
$01^* + 1$

Ejercicio:
$(0 + 1)^*1(0 + 1)$

2.4.2. AFD ⇒ ER

AFD

A = (Q, Σ, δ, q_1, F)

Q = {q_1, q_2, q_3, …, q_n}

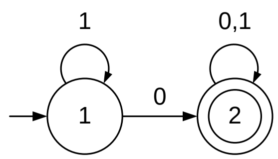
ER

$$L(A) = \bigcup_{q_j \in F} {R_{1j}}^n$$

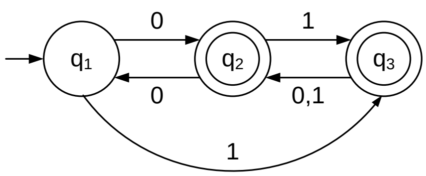
$$ {R_{ij}}^0 = \begin{cases} \{\sigma \in \Sigma \;/\; \delta(q_i,\sigma) = q_j\} & \text{si} \quad i \neq j \\ \{\sigma \in \Sigma \;/\; \delta(q_i,\sigma) = q_j\} \cup \{\varepsilon\} & \text{si} \quad i = j \end{cases} $$

$$ {R_{ij}}^k = {R_{ij}}^{k-1} \cup {R_{ik}}^{k-1}({R_{kk}}^{k-1})^* {R_{kj}}^{k-1} $$

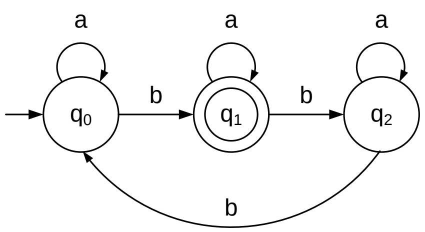
Ejemplo:



Tarea 1:



Tarea 2:



2.4.3. AFN $\Rightarrow$ ER

Ecuaciones Lineales

AFN
$A = (Q, \Sigma, \delta, q_0, F)$

ER
$X_i = \{\omega \in \Sigma^* / \delta(q_i, \omega) \cap F \neq \emptyset\}$

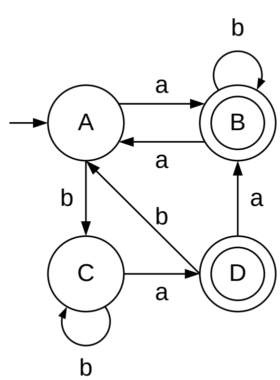
$$X_i = \bigcup_{\sigma \in \Sigma} \{\sigma X_j \ / \ q_j \in \delta(q_i, \sigma)\} \qquad \forall q_i \in (Q - F)$$

$$X_i = \bigcup_{\sigma \in \Sigma} \{\sigma X_j \ / \ q_j \in \delta(q_i, \sigma)\} \cup \{\varepsilon\} \qquad \forall q_i \in F$$

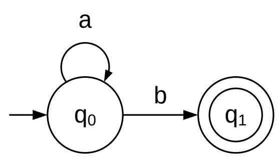
$L(A) = X_0$

Lema de Arden
$X = AX + B \text{ , } \varepsilon \notin A \Rightarrow X = A^*B$

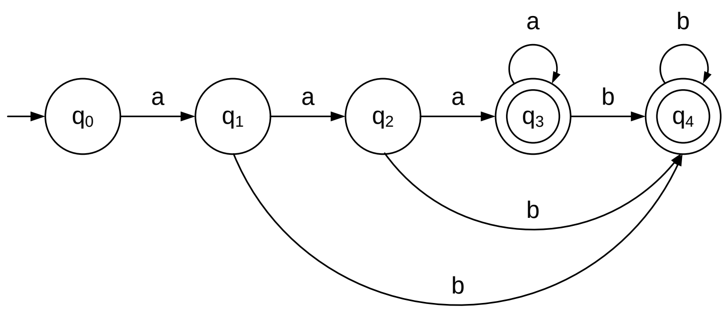
Ejemplo:



Ejercicio 1:



Ejercicio 2:



Ejercicio 3: