# 2.4. EQUIVALENCIAS

### 2.4.1. ER $\Rightarrow$ AFN- $\epsilon$

Tabla 2.2. Construcción de Thompson.

ER	AFN-ε
Ø	$\rightarrow$ $q_0$ $f$
3	$ q_0$ $\epsilon$ $f$
$\sigma \in \Sigma$	$ q_0$ $\sigma$ $f$

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### ER

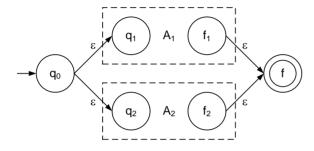
 $r_1 + r_2$ 

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

$$A_2 = (Q_2, \Sigma_2, \delta_2, q_2, \{f_2\})$$

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

### AFN-ε



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

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

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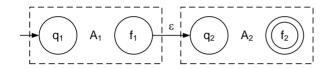
### ER

 $r_1r_2$ 

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

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

### AFN-ε



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

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

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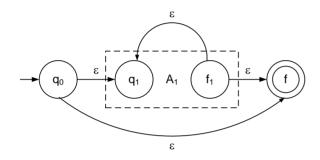
# ER

 $r_1^*$ 

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

$$L(A_1) = L(r_1)$$

### AFN-ε



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

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

Ejemplo:

$$01^* + 1$$

Ejercicio:

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

### $2.4.2. AFD \Rightarrow ER$

### **AFD**

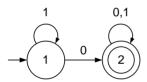
$$A = (Q, \Sigma, \delta, q_1, F)$$

$$Q = \{q_1, q_2, q_3, ..., q_n\}$$

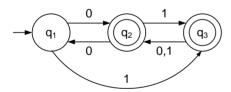
#### $\mathbf{F}\mathbf{R}$

$$\begin{split} L(A) &= \bigcup_{q_j \in F} R_{1j}^{n} \\ R_{ij}^{0} &= \begin{cases} \{\sigma \in \Sigma / \delta(q_i, \sigma) = q_j\} & \text{si} \quad i \neq j \\ \{\sigma \in \Sigma / \delta(q_i, \sigma) = q_j\} \cup \{\epsilon\} & \text{si} \quad i = j \end{cases} \\ R_{ij}^{k} &= R_{ij}^{k-1} \cup R_{ik}^{k-1} (R_{kk}^{k-1})^* R_{kj}^{k-1} \end{split}$$

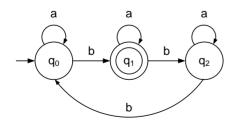
# Ejemplo:



### Tarea 1:



### Tarea 2:



### $2.4.3. \text{ AFN} \Rightarrow \text{ER}$

**Ecuaciones Lineales** 

### **AFN**

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

#### ER

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

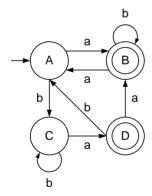
$$\begin{split} X_i &= \bigcup_{\sigma \in \Sigma} \{ \sigma X_j \: / \: q_j \in \delta(q_i, \sigma) \} \\ X_i &= \bigcup_{\sigma \in \Sigma} \{ \sigma X_j \: / \: q_j \in \delta(q_i, \sigma) \} \cup \{ \epsilon \} \end{split} \qquad \forall q_i \in (Q - F) \end{split}$$

$$L(A) = X_0$$

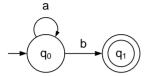
Lema de Arden

$$X = AX + B$$
,  $\epsilon \notin A \Rightarrow X = A^*B$ 

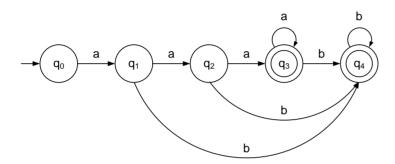
# Ejemplo:



# Ejercicio 1:



# Ejercicio 2:



# Ejercicio 3:

