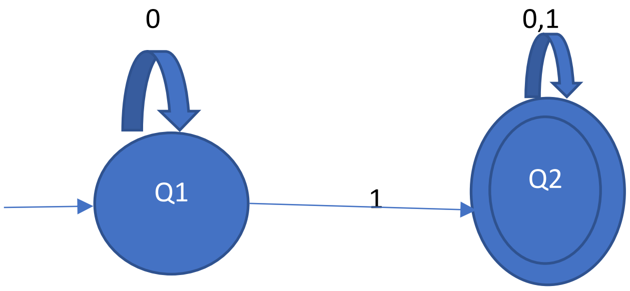
Finite Automata to Regular Expression(transitive Closure method)

Construct the regular expression for the given finite Automata



$$\boxed{R^{k}_{ij} = R^{k-1}_{ik}\,(R^{k-1}_{kk})^{*}\,R^{k-1}_{kj} + R^{k-1}_{ij}}$$

<u>Rules</u>

1. $(€+r)^* = r^*$
2. w0+0=w0/0w+0=0w
3. $0(0)^*=0^*$
4. $€(€)^* = €^*$
5. $€^*$ can be eliminated when accompanied by any term
6. Any term multiplied by Ø is Ø
7. $(00)^*(€+0) \rightarrow 0^*$

$$R_{ij}^{0} = \begin{cases} \{a \mid \delta(q_i, a) = q_j\} & \text{if } i \neq j \\ \{a \mid \delta(q_i, a) = q_j\} \cup \{\epsilon\} & \text{if } i = j \end{cases}$$

K	0	1
R_{11}	0+€	0^*
R_{12}	1	0^*1
R_{21}	Ø	Ø
R_{22}	€+0+1	€+0+1

K=1

$R^{k}_{ij} = R^{k-1}_{ik} (R^{k-1}_{kk})^{*} R^{k-1}_{kj} + R^{k-1}_{ij}$

$R^{1}_{11} = R^{0}_{11} (R^{0}_{11})^{*} R^{0}_{11} + R^{0}_{11}$

$= \underbrace{(€+0)\ (€+0)^{*}}_{W}\ \underbrace{(€+0)}_{0} + \underbrace{(€+0)}_{0}$

$= (€+0)\ (€+0)^{*}\ (€+0)$

$= (€+0)\ (€+0)^{*}$[r3]

$= (€+0)^{*}$

$= 0^{*}$

$R^{1}_{12} = R^{0}_{11} (R^{0}_{11})^{*} R^{0}_{12} + R^{0}_{12}$

$= (€+0)\ (€+0)^{*} 1+1$

$=(€+0)\ (€+0)^{*}\ 1$

$= (€+0)^{*}\ 1$

$=0^{*}1$

$R^{1}_{21} =R^{0}_{21}(R^{0}_{11})^{*}\ R^{0}_{11} + R^{0}_{21}$

$= \emptyset(€+0)^{*}(\ €+0) + \emptyset$

$= \emptyset + \emptyset$

$\boxed{R^{1}_{21} = \emptyset}$

$R^{1}_{22} =R^{0}_{21}(R^{0}_{11})^{*}\ R^{0}_{12} + R^{0}_{22}$

$= \emptyset(€+0)^{*}\ 1+ (€+0+1)$

$\boxed{R^{1}_{22} = €+0+1}$

K =2

$R^2_{12} = R^1_{12}(R^1_{22})^* R^1_{22} + R^1_{12}$

$= 0^*1(€+0+1)^* (€+0+1) + 0^*1$

$= 0^*1 (€+0+1)^* (€+0+1)$

$= 0^*1(€+0+1)^*$

$R^2_{12} = 0^*1 (0+1)^*$