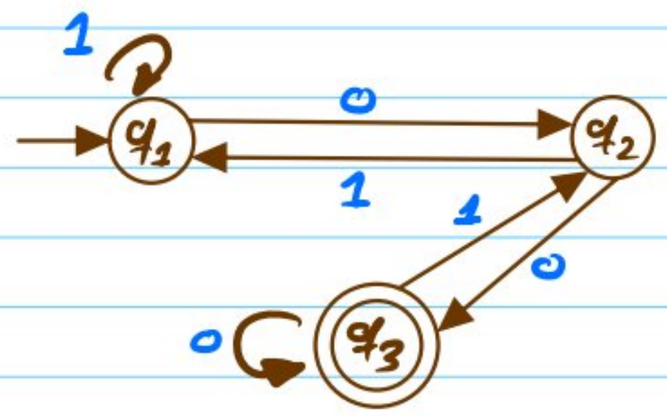
Qutaiba ALASHQA, 2029003 6.

Ex// 3.2.1 //

DFA tuple

	0	1
→ q_1	q_2	q_1
q_2	q_3	q_1
* q_3	q_3	q_2



ⓐ $R_{ij}^{(0)}$

$R_{12}^{\{0\}} = \epsilon + 1$, ϵ, cause of, starting and ending at the same state.

$R_{12}^{\{0\}} = 0$, $R_{22}^{\{0\}} = \epsilon$, $R_{32}^{\{0\}} = 1$

$R_{13}^{\{0\}} = \phi$, $R_{23}^{\{0\}} = 0$, $R_{33}^{\{0\}} = \epsilon + 0$

$R_{21}^{\{0\}} = \phi$, $R_{21}^{\{0\}} = \phi$

ⓑ $R_{ij}^{\{1\}}$, where k = 1 we have to simplify it as much as possible

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

$$R_{ij}^{\{1\}} = R_{ij}^{\{0\}} + R_{i1}^{\{0\}} \left(R_{11}^{\{0\}}\right)^* R_{1j}^{\{0\}}$$

* $R_{11}^{\{1\}} = R_{11}^{\{0\}} + R_{11}^{\{0\}} \left(R_{11}^{\{0\}}\right)^* R_{11}^{\{0\}}$

$R_{11}^{\{1\}} = \epsilon + 1 + (\epsilon + 1)(\epsilon + 1)^* (\epsilon + 1) = 1$

* $R_{12}^{(3)} = R_{12}^{(2)} + R_{11}^{(2)} (R_{11}^{(2)})^* R_{12}^{(2)}$

$R_{12}^{(3)} = \emptyset + (\epsilon+1)(\epsilon+1)^* \emptyset$

$R_{12}^{(3)} = 1^* \emptyset$

* $R_{13}^{(3)} = R_{12}^{(0)} + R_{11}^{(0)} (R_{11}^{(0)})^* R_{13}^{(0)}$

$R_{13}^{(3)} = \emptyset + (\epsilon+1)(\epsilon+1)^* \emptyset$

$R_{13}^{(3)} = \emptyset$

* $R_{21}^{(3)} = R_{21}^{(2)} + R_{21}^{(2)} (R_{11}^{(2)})^* R_{11}^{(2)}$

$= 1 + 1 (\epsilon+1)^* \epsilon+1$

$= 1^*$

* $R_{22}^{(3)} = R_{22}^{(2)} + R_{21}^{(2)} (R_{11}^{(2)})^* R_{12}^{(2)}$

$= \epsilon + 1 (\epsilon+1)^* \emptyset$

$= 1^* \emptyset$

* $R_{23}^{(3)} = R_{23}^{(2)} + R_{21}^{(2)} (R_{11}^{(2)})^* R_{13}^{(2)}$

$= \emptyset + 1 (\epsilon+1)^* \emptyset$

$= \emptyset$

* $R_{31}^{(3)} = R_{31}^{(2)} + R_{31}^{(2)} (R_{11}^{(2)})^* R_{11}^{(2)}$

$= \emptyset + \emptyset (\epsilon+1)^* (\epsilon+1)$

$= \emptyset$

* $R_{32}^{(3)} = R_{32}^{(2)} + R_{31}^{(2)} (R_{11}^{(2)})^* R_{12}^{(2)}$

$= 1 + \emptyset (\epsilon+1)^* \emptyset = 1$

* $A_{33}^{(1)} = R_{33}^{(0)} + R_{31}^{(0)} (R_{11}^{(0)})^* R_{13}^{(0)}$

$= \epsilon + 0 + \phi (\epsilon + 1)^* \phi$

$= \epsilon + 0$

(c) $R_{ij}^{(2)}$

$R_{ij}^{(2)} = R_{ij}^{(1)} + R_{i2}^{(1)} (R_{22}^{(1)})^* R_{21}^{(1)}$

* $A_{11}^{(2)} = R_{11}^{(1)} + R_{12}^{(1)} (R_{22}^{(1)})^* R_{21}^{(1)}$

$R_{11}^{(2)} = 1^* + 1^* 0 (1^* 0)^* 1^*$

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

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

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

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

* $R_{13}^{(2)} = R_{13}^{(1)} + R_{12}^{(1)} (R_{22}^{(1)})^* R_{23}^{(1)}$

$= \phi + 1^* 0 (1^* 0)^* 0$

$= 1^* 0 (1^* 0)^* 0$

* $R_{21}^{(1)} = R_{21}^{(0)} + R_{22}^{(0)} (R_{22}^{(0)})^* R_{21}^{(0)}$

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

* $R_{22}^{(1)} = R_{22}^{(0)} + R_{22}^{(0)} (R_{22}^{(0)})^* R_{22}^{(0)}$

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

* $R_{23}^{(2)} = R_{23}^{(1)} + R_{22}^{(1)} (R_{22}^{(1)})^* R_{23}^{(1)}$

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

* $R_{31}^{(1)} = R_{31}^{(1)} + R_{32}^{(1)} (R_{22}^{(1)})^* R_{21}^{(1)}$

$= \phi + 1 (1^* 0)^* 1^*$

$= 1 (1^* 0)^* 1^*$

* $R_{32}^{(2)} = R_{32}^{(1)} + R_{32}^{(1)} (R_{22}^{(1)})^* R_{22}^{(1)}$

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

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

* $R_{33}^{(1)} = R_{33}^{(1)} + R_{32}^{(1)} (R_{22}^{(1)})^* R_{23}^{(1)}$

$= \epsilon + 0 + 1 (1^* 0)^* 0$

(d) ??

(e) ??

Ex // 3.2.2 //

	0	1
→ q_1	q_2	q_3
q_2	q_1	q_3
*q_3	q_2	q_1

(a) $R_{11}^{(0)} = \phi$, $R_{12}^{(0)} = 0$, $R_{21}^{(0)} = 0$, $R_{22}^{(0)} = \phi$, $R_{13}^{(0)} = 1$

$R_{23}^{(0)} = 1$, $R_{31}^{(0)} = 1$, $R_{32}^{(0)} = 0$, $R_{33}^{(0)} = \phi$

(b) $R_{ij}^{(1)}$

* $R_{11}^{(1)} = R_{11}^{(0)} + R_{11}^{(0)} (R_{11}^{(0)})^* R_{11}^{(0)}$
$= \phi + \phi(\phi)^* \phi$
$= \phi$

* $R_{12}^{(1)} = R_{12}^{(0)} + R_{11}^{(0)} (R_{11}^{(0)})^* (R_{12})^{(0)}$
$= 0 + 0(\phi)^* 0$
$= 0 (\epsilon + 0^*)$

* $R_{13}^{(1)} = R_{13}^{(0)} + R_{13}^{(0)} (R_{11}^{(0)})^* R_{13}^{(0)}$
$= 1 + \phi(\phi)^* 1$
$= 1 + 1$

* $R_{21}^{(1)} = R_{21}^{(0)} + R_{21}^{(0)} (R_{11}^{(0)})^* R_{11}^{(0)}$
$= 0 + 0(\phi)^* \phi$
$= 0 + 0$

* $R_{22}^{(1)} = R_{22}^{(0)} + R_{21}^{(0)} (R_{11}^{(0)})^* R_{12}^{(0)}$
$= \phi + 0(\phi)^* 0$
$= 00$

* $R_{23}^{(1)} = R_{23}^{(0)} + R_{21}^{(0)} (R_{11}^{(0)})^* R_{13}^{(0)}$
$= 1 + 0(\phi)^* 1 = 1 + 01$

* $R_{33}^{(1)} = R_{33}^{(0)} + R_{31}^{(0)} (R_{11}^{(0)})^* R_{13}^{(0)}$
$= \phi + 1(\phi)^* 1$
$= 11$

(c) $R_{ij}^{(2)}$ ——

* $R_{11}^{(2)} = R_{11}^{(1)} + R_{12}^{(1)} (R_{12}^{(1)})^* R_{21}^{(1)}$
$= \phi + (0+00+0)(00)^* (0+0)$
$= (0+00^+)(00)^* (0+0)$

* $R_{12}^{(2)} = R_{12}^{(1)} + R_{12}^{(1)} (R_{21}^{(1)})^* R_{22}^{(1)}$
$= 0(\epsilon+0^+) + 0(\epsilon+0^+)(00)^* 00$
$= 0(\epsilon+0^+)(\epsilon+00)^* 00$

* $R_{13}^{(2)} = R_{13}^{(1)} + R_{12}^{(1)} (R_{22}^{(1)})^* R_{23}^{(1)}$
$= (1+1) + 0(\epsilon+0^+)(00)^* (1+01)$
$= 1 + 0(\epsilon+0^+)(00)^* (1+01)$

* $R_{21}^{(2)} = R_{21}^{(1)} + R_{22}^{(1)} (R_{22}^{(1)})^* R_{21}^{(1)}$
$= (0+0) + (00)(00)^* (0+0)$
$= (0+0)(\epsilon + (00)^+)$

* $R_{22}^{(2)} = R_{22}^{(1)} + R_{22}^{(1)} (R_{22}^{(1)})^* R_{22}^{(1)}$
$= (00)^+$

* $R_{23}^{(2)} = R_{23}^{(1)} + R_{23}^{(1)} (R_{22}^{(1)})^* R_{23}^{(1)}$
$= (R_{22}^{(1)})^* R_{23}^{(1)}$
$= ((00)^+)^* (1+01)$

* $R_{31}^{(2)} = R_{31}^{(1)} + R_{32}^{(1)} (R_{22}^{(1)})^* R_{21}^{(1)}$
$= (1+1) + (0+10)(00)^* (0+0)$
$= (1+1)(0+10)00^* (0+0)$

* $R_{32}^{(2)} = R_{32}^{(1)} + R_{32}^{(1)} (R_{22}^{(1)})^* R_{22}^{(1)}$
$= (0+16) + (0+10)(00)^* (05)$
$= (0+10)(\epsilon+00^+)$

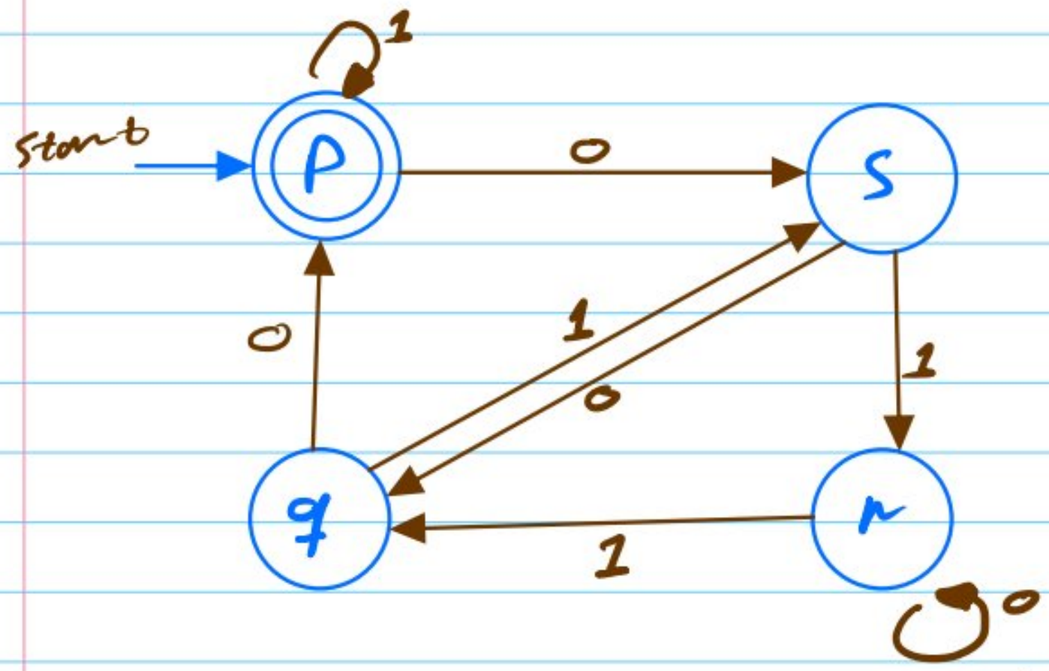
* $R_{rr}^{(2)} = R_{33}^{(1)} + R_{23}^{(1)} (R_{22}^{(1)})^* R_{23}^{(1)}$

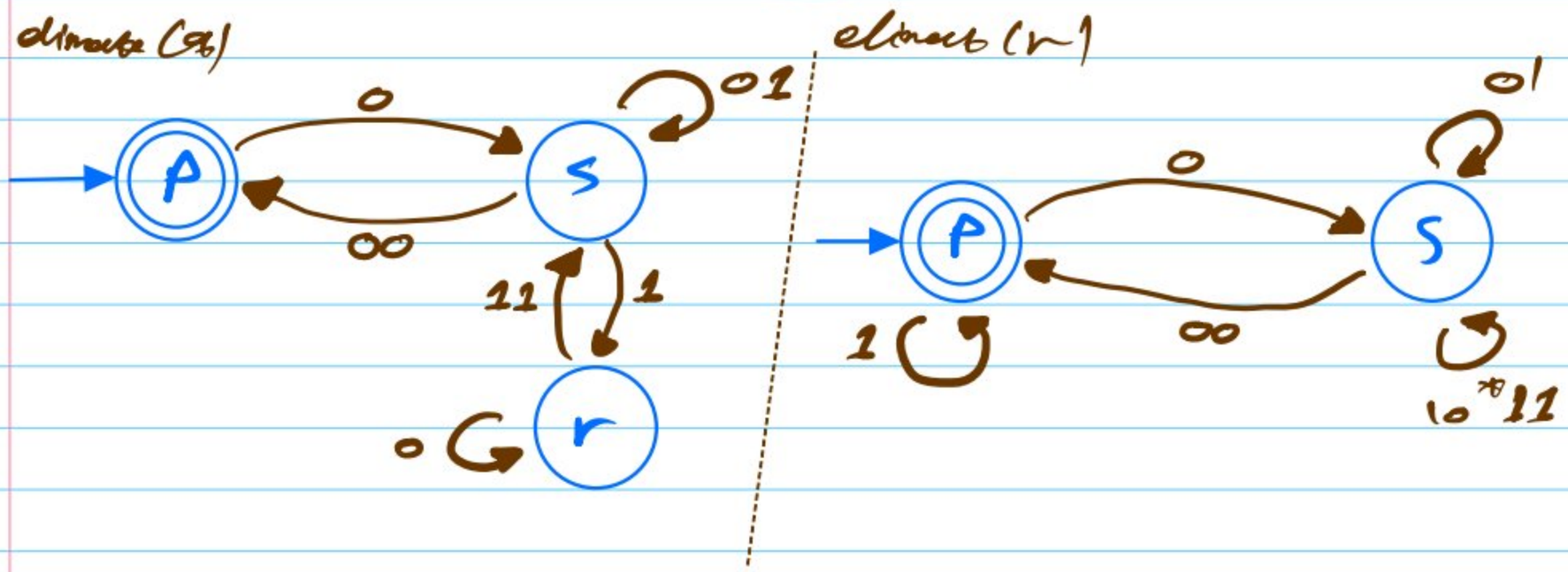
$= 11 + (0+10)(00)^* (1+01)$

$= 11 + (0+10)(00)^* (1+01)$

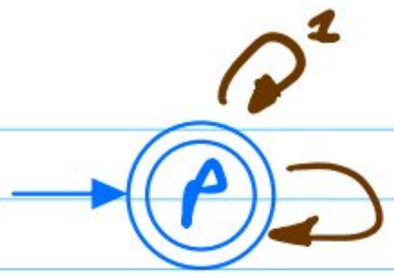
Ex// 3.2.3 //

	0	1
→*p	s	p
q	p	s
r	r	q
s	q	r





elimden (s):



$0(01+10^*11)^*00$

* Regular Exp = $(1+0(01+10^*11)^*00)^*$

Ex // 3.4.1 //

(a) $R+S = S+R$ ✓ ??

(b) $(R+S)+T = R+(S+T)$

birleşimden dolayı ✓

(c) $(RS)T = R(ST)$

(d) $R(S+T) = RS+RT$

(e) $(R+S)T = RT+ST$

$R=0,\ S=1,\ T=1$

$(0+1)1 = (01)+(11)$ ✓

(g) $(\epsilon+R)^* = R^*$

(h) $(R^*S^*)^* = (R+S)^*$ $R=0,\ S=1$

$(0^*1^*)^* = \epsilon(0+1)^*$ ✓