

Ex. 3.1.1

a.)  $c^* a (a+c)^* b (a+b+c)^* + c^* b (b+c)^* a (a+b+c)^*$

b.)  $(0+1)^* | (0+1)^9$

c.)  $(0+10)^* (11+\epsilon) (0+10)^*$

Ex 3.1.2

a.) Set of all strings of 0's and 1's such that every pair of adjacent 0's appears before any pair of adjacent 1's.

$\Rightarrow (0+10)^* (1+01)^* (0+\epsilon)$

b.) Set of all strings of 0's and 1's whose number of 0's is divisible by 5.

$(1^* 01^* 01^* 01^* 01^* 01^*) + 1^*$

Ex 3.2.1

	0	1
$\rightarrow q_1$	$q_2$	$q_1$
$q_2$	$q_3$	$q_1$
$q_3$	$q_3$	$q_2$

a.) Give all regular expressions  $R_{ij}^{(0)}$

$R_{11} = \epsilon + 1$	$R_{22} = \epsilon$	$R_{33} = \epsilon + 0$
$R_{12} = 0$	$R_{23} = 0$	
$R_{13} = \emptyset$	$R_{31} = \emptyset$	
$R_{21} = 1$	$R_{32} = 1$	

b.) Give all regular expressions  $R_{ij}^{(1)}$

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

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

$R_{13} = \emptyset$

$R_{21} = 1 + 1(1+\epsilon)^*(1+\epsilon) = 1^*$

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

$R_{23} = 0$

$R_{31} = \emptyset$

$R_{32} = 1$

$R_{33} = 0 + \epsilon$

c.) Give all regular expressions  $R_{ij}^{(2)}$

$R_{11} = 1^* + 1^* 0 (\epsilon + 1^* 0)^* 1^* = (1+01)^*$

$R_{12} = 1^* 0 (\epsilon + 1^* 0)^* = (1+01)^* 0$

$R_{13} = \emptyset + 1^* 0 (\epsilon + 1^* 0)^* 0 = (1+01)^* 00$

$R_{21} = (\epsilon + 1^* 0) 1^* = 1^* (\epsilon + 01)$

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

$R_{23} = (\epsilon + 1^* 0)^* 0 = (1+0)^* 0$

$R_{31} = \emptyset + 1(\epsilon + 1^* 0)^* 1^* = 1(1^* 0)^*$

$R_{32} = 1 + 1(\epsilon + 1^* 0)^* = 1(1^* 0)^*$

$R_{33} = (0 + \epsilon) + 1(\epsilon + 1^* 0)^* 0$

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

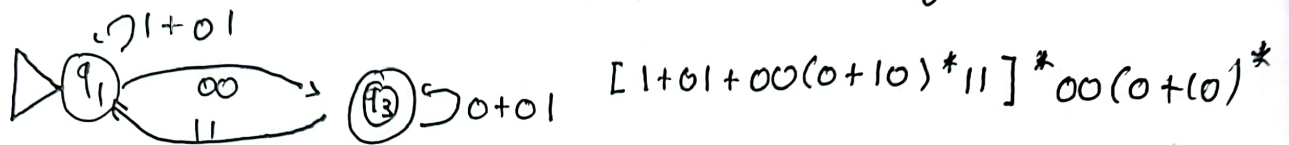
d.) Give regular expressions for the language of automaton

K3

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

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

e.) Construct the transition diagram for the DFA and give a regular expression for its language by eliminating state  $q_e$ .



### EX 3.2.3

Repeat ex 3.2.1 for the following DFA :

	0	1
$\rightarrow q_1$	$q_2$	$q_3$
$q_2$	$q_1$	$q_3$
$^*q_3$	$q_2$	$q_1$

