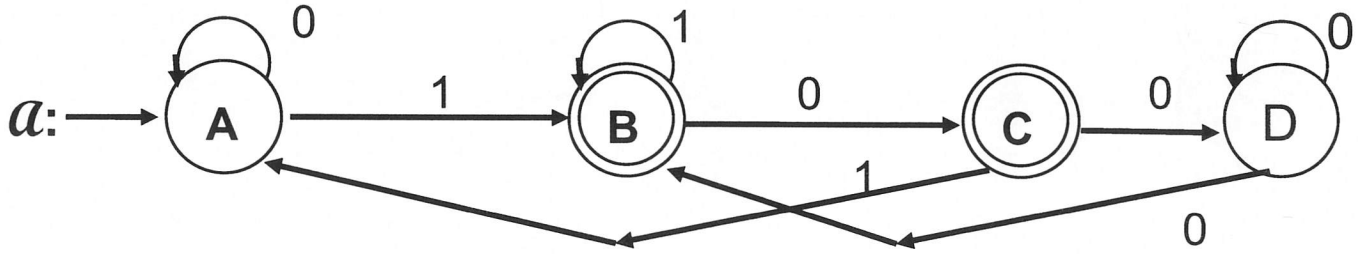
Assignment # 4.1 Key

1. Convert the DFA below to a regular expression, first by using either the GNFA (or state ripping) or the R_{ij}^{k} approach, and then by using regular equations. You must show all steps in each part of this solution.



$L = R_{13}^4 + R_{12}^4$

Assignment # 4.1 Key (R_{ij}^k)

$R_{11}^0 = \lambda + 0$ $R_{12}^0 = 1$ $R_{13}^0 = \phi$ $R_{14}^0 = \phi$ $R_{21}^0 = \phi$ $R_{22}^0 = \lambda + 1$ $R_{23}^0 = 0$ $R_{24}^0 = \phi$

$R_{31}^0 = 1$ $R_{32}^0 = \phi$ $R_{33}^0 = \lambda$ $R_{34}^0 = 0$ $R_{41}^0 = \phi$ $R_{42}^0 = 0$ $R_{43}^0 = \phi$ $R_{44}^0 = \lambda + 0$

$R_{11}^1 = 0^*$ $R_{12}^1 = 0^*1$ $R_{13}^1 = \phi$ $R_{14}^1 = \phi$ $R_{21}^1 = \phi$ $R_{22}^1 = \lambda + 1$ $R_{23}^1 = 0$ $R_{24}^1 = \phi$

$R_{31}^1 = 10^*$ $R_{32}^1 = 10^*1$ $R_{33}^1 = \lambda$ $R_{34}^1 = 0$ $R_{41}^1 = \phi$ $R_{42}^1 = 0$ $R_{43}^1 = \phi$ $R_{44}^1 = \lambda + 0$

$R_{11}^2 = 0^*$ $R_{12}^2 = 0^*1 +$ $R_{13}^2 = 0^*1 + 0$ $R_{14}^2 = \phi$ $R_{21}^2 = \phi$ $R_{22}^2 = 1^*$ $R_{23}^2 = 1^*0$ $R_{24}^2 = \phi$

$R_{31}^2 = 10^*$ $R_{32}^2 = 10^*1 +$ $R_{33}^2 = \lambda + 10^*1 + 0$ $R_{34}^2 = 0$ $R_{41}^2 = \phi$ $R_{42}^2 = 01^*$ $R_{43}^2 = 01^*0$ $R_{44}^2 = \lambda + 0$

$R_{12}^3 = 0^*1 + + 0^*1 + 0(10^*1 + 0)^*10^*1 +$

$R_{14}^3 = 0^*1 + 0(10^*1 + 0)^*0$

$R_{43}^3 = 01^*0(10^*1 + 0)^*$

$R_{13}^3 = 0^*1 + 0(10^*1 + 0)^*$

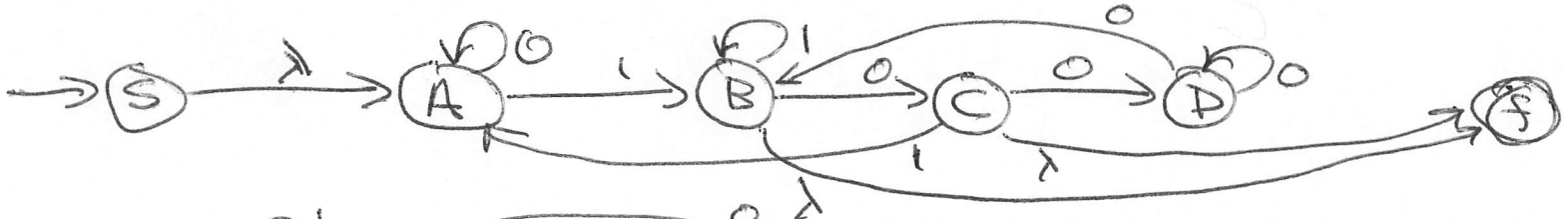
$R_{42}^3 = 01^* + 01^*0(10^*1 + 0)^*10^*1 +$

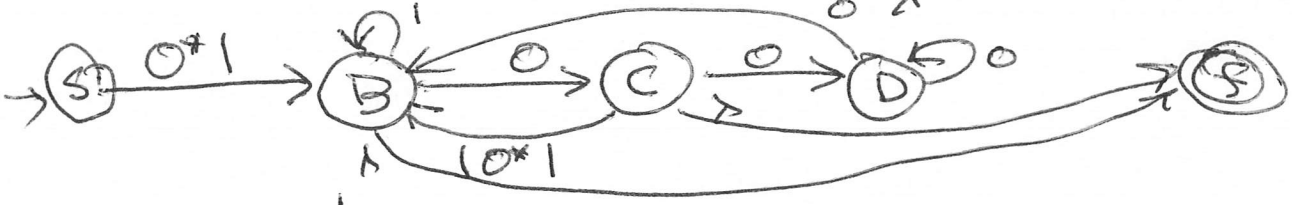
$R_{44}^3 = \lambda + 0 + 01^*0(10^*1 + 0)^*0$

$R_{12}^4 = 0^*1 + + 01 + + 01 + 0(10^*1 + 0)^*10^*1 + + 0^*1 + 0(10^*1 + 0)^*0(0 + 01^*0(10^*1 + 0)^*0)^*$
$(01^* + 01^*0(10^*1 + 0)^*10^*1 +)$

$R_{13}^4 = 0^*1 + 0(10^*1 + 0)^*0 + 0^*1 + 0(10^*1 + 0)^*0(10^*1 + 0)^*0(0 + 01^*0(10^*1 + 0)^*0)^*$
$(01^*0 + 10^*1 + 0)^*)$

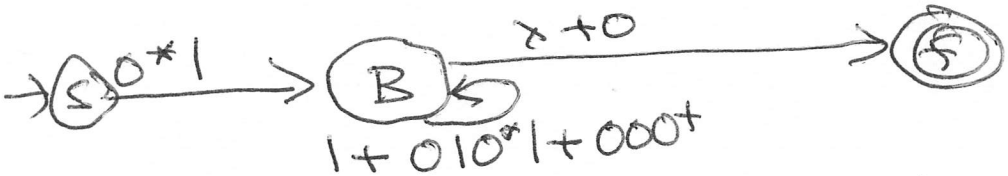
Assignment # 4.1 Key (Rip)



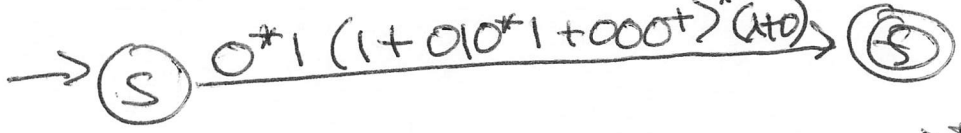


RIP A

RIP D



RIP C



$$L = 0^*1(1+010^*1+000^+)^*(0+\lambda)$$

Assignment # 4.1 Key (R EQ)

A = λ + C1 + A0
B = A1 + D0 + B1
C = B0
D = C0 + D0

A = λ + C1 + A0 = λ + B01 + A0 = (λ + B01) 0*
D = C0 + D0 = B00 + D0 = B000*
B = A1 + D0 + B1 = (λ + B01) 0*1 + B0000* + B1 = 0*1+B(010*1+0000*+1)
= 0*1(010*1+0000*+1)*
C = 0*1(010*1+0000*+1)*0
L = 0*1(010*1+0000*+1)* (0 + λ)

Pretty ugly

Assignment # 4.2 (asked)

3. a.) Minimize the number of states in the following DFA, showing the determination of incompatible states (table on right).

	a	b	c
>1	2	3	5
2	5	4	4
3	2	4	5
4	6	4	2
5	5	2	4
6	5	4	2

2	2,5 X 3,4 X 4,5				
3	X	X			
4	2,6 X 3,4 X	5,6 X	X		
5	2,5 2,3 X 4,5	2,4 X	X	5,6 X 2,4 X	
6	X	X	2,5 X	X	X
	>1	**2**	**3**	**4**	5

b.) No Minimization as original is minimal.

Assignment # 4.2 (intended)

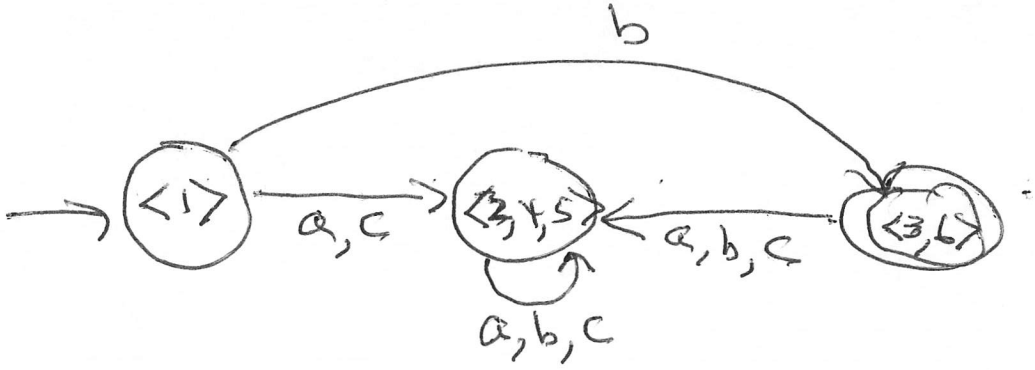
3. a.) Minimize the number of states in the following DFA, showing the determination of incompatible states (table on right).

	a	b	c
>1	2	3	5
2	5	4	4
3	2	4	5
4	5	4	2
5	5	2	4
6	5	4	2

	>1	2	3	4	5
2	2,5 X 3,4 X 4,5				
3	X	X			
4	2,5 3,4 X	✓	X		
5	2,5 2,3 X 4,5	2,4	X	2,4	
6	X	X	2,5	X	X

b.) Can combine 2,4,5 and 3,6 so have states <1>, <2,4,5>, <3,6>

Assignment # 4.2 (intended)



THIS MACHINE RECOGNIZES {b}