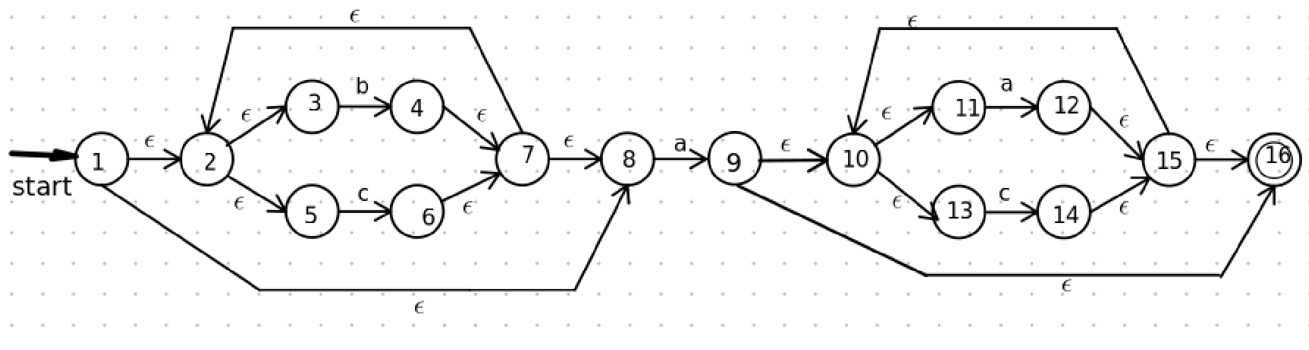
Owen Daigle – Assignment 2 – 300359036

Question 1

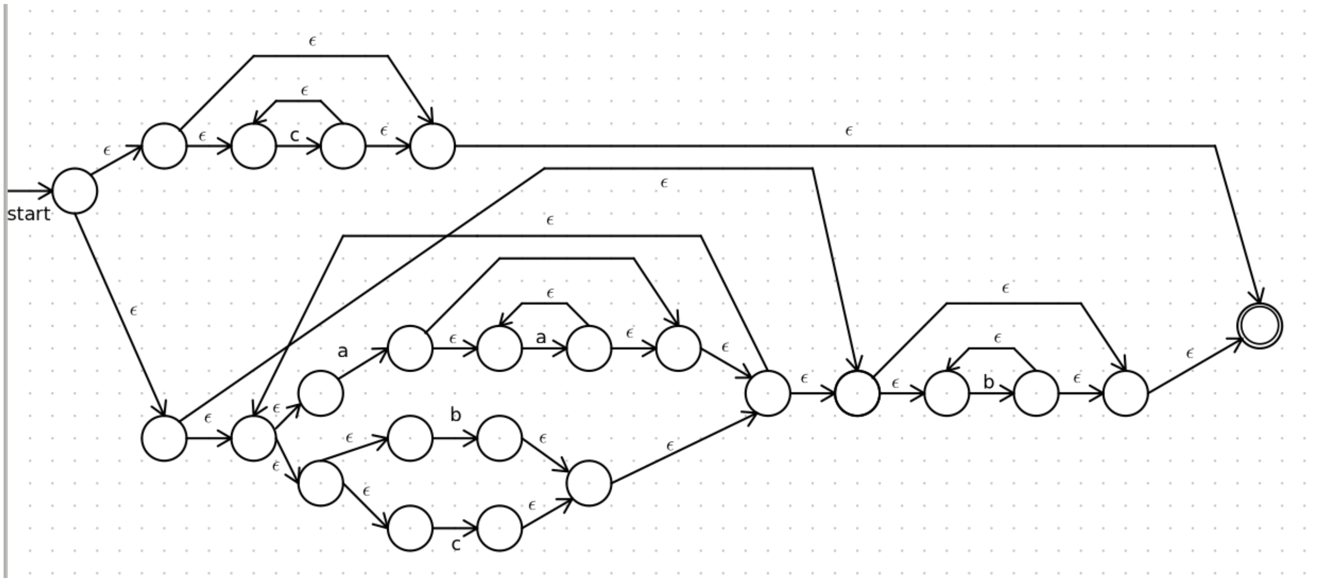
1. ((a|b)(a|b))*
2. b*ab*(ab*ab*)*b*
3. a*|(a*ba*ba*)*
4. (a(a*b*)*b)|(b(a*b*)*a)
5. b*(ab)*b
6. (0*1*(11(11|10|01)11))|(1*0*1(0|1)+(0|1)+(0|1)+(0|1)+(0|1)+(0|1)+)
7. (+|-)(0|(1|2|...|9)(0|1|...|9)*)[a-zA-Z]+([1-3][0-9]|4[0-4]|[4-9])

Question 2

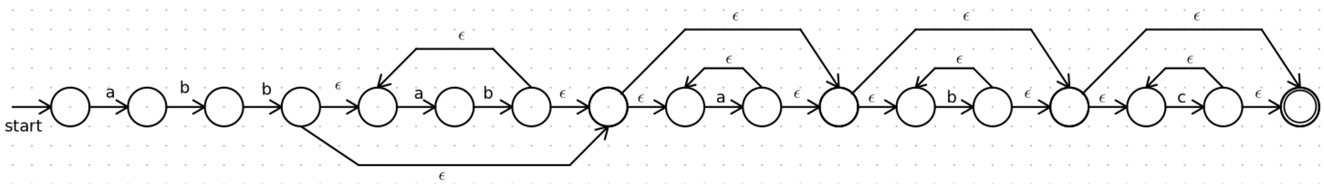
Part a.



Part b.



Part c.



Question 3

Part a.

This is just (a*|b*)*

I create my state table:

State	State after a	State after b
A	B	C
B	B	C
C	B	C

States	Epsilon Closures
A = {0,1,2,3,4,5,8,9,10,11} B = {1,2,3,4,5,6,8,9,10,11} C = {1,2,3,5,6,7,8,9,10,11}	ε{0} = A ε{6} = B ε{7} = C

I find epsilon closure of 0: {0,1,2,3,4,5,8,9,10,11} = A

Then I do epsilon closure of move(A,a). move(A,a) gives {6} and then epsilon closure of {6} gives {1,2,3,4,5,6,8,9,10,11} = B

Then I do epsilon closure of move(A,b). move(A,b) gives {7}, and then epsilon closure of {7} gives {1,2,3,5,6,7,8,9,10,11} = C

Now I move onto move operations with B and C. move(B,a) gives {6} which we know its epsilon closure is B as calculated before

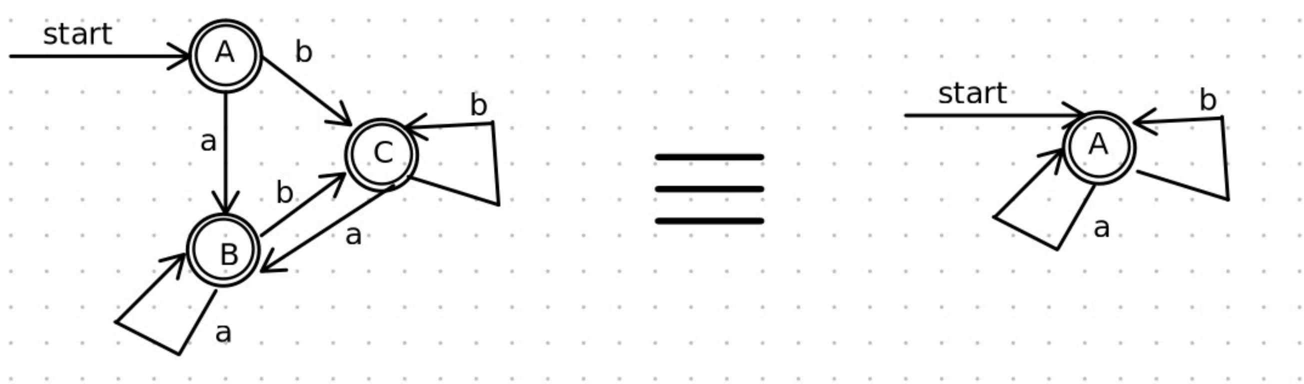
move(B,b) gives {7} which we also know the epsilon closure just gives C which has already been calculated.

move(C,a) gives {6}, and move(C,b} gives 7 which we know their respective epsilon closures are B and C which are known states.

Since we have gone through all situations, we are done.

The end state is 11, so all states with the 11 substate are end states. Here this is all states. We can also simplify it to just 1 state since all states go to the same place after transions a and b.

Now I can draw this out:



Part b.

I create my state table:

State	State after a	State after b
A	B	A
B	C	D
C	E	F
D	G	H
E	E	F
F	G	H
G	C	D
H	B	A

States	Epsilon Closures
A = {0} B = {0,1} C = {0,1,2} D = {0,2} E = {0,1,2,3} F = {0,2,3} G = {0,1,3} H = {0,3}	ε{0} = A ε{0,1} = B ε{0,1,2} = C ε{0,2} = D ε{0,1,2,3} = E ε{0,2,3} = F ε{0,1,3} = G ε{0,3} = H

I start by finding epsilon closure at the start: {0} = A

Now I do move(A,a) = {0,1} and ε{0,1} = {0,1}

Now I do move (A,b) = {0} and we know ε{0} = A.

Now I move onto state B

Now I do move(B,a) = {0,1,2} and ε{0,1,2} = {0,1,2}

Now I do move(B,b) = {0,2} and ε{0,2} = {0,2}

Now I move onto state C

Now I do move(C,a) = {0,1,2,3} and ε{0,1,2,3} = {0,1,2,3}

Now I do move(C,b) = {0,2,3} and ε{0,2,3} = {0,2,3}

Now I move onto state D

Now I do move(D,a) = {0,1,3} ε{0,1,3} = {0,1,3}

Now I do move(D,b) = {0,3} and ε{0,3} = {0,3}

Now I move onto state E

Now I do move(E,a) = {1,2,3,4} which we already know as E.

Now I do move(E,b) = {0,2,3} which we already know as F.

Now I move onto state F

Now I do move(F,a) = {0,1,3} which we already know as G.

Now I do move(F,b) = {0,3} which we already know as H.

Now I move onto state G

Now I do move(G,a) = {0,1,2} which we already know as C

Now I do move(G,b) = {0,2} which we already know as D.

Now I move onto H

Now I do move(H,a) = {0,1} which we already know as B

Now I do move(H,b) = {0} which we already know as A

Since there are no more states, we are done.

The completion states are all the states that contain 3 so {E,F,G,H}