Homework #2

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1. For Σ = {*a*, *b*}, construct dfa's that accept the sets consisting of

(a) all strings with no more than two *a*'s. (最多兩個a)

L(G) ->

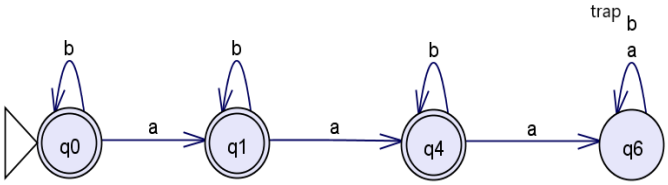
0 a = b*

1 a = b*ab*

2 a = b*ab*ab*

Regular expression:　　b* + b*ab* + b*ab*ab*

DFA:



(b) all strings with at least one *b* and exactly two *a*'s. (hint: label the state by a two-digit number such that the first digit represents the number of a's and the second digit represents the number of b's.) (只有兩個a和至少一個b組成)

L(G) =

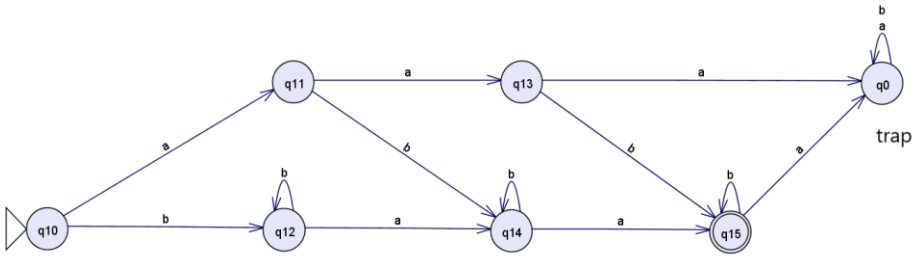
(aab) = b*ab*ab*bb*

(aba) = b*ab*bb*ab*

(baa) = b*bb*ab*ab*

Regular expression: b*ab*ab*bb* + b*ab*bb*ab* + b*bb*ab*ab*

DFA:



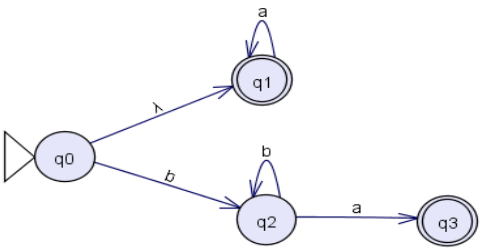
2. Find an nfa with four states for $L = \{a^n : n \geq 0\} \cup \{b^n a : n \geq 1\}$.

L(G) =

$(a^n : n \geq 0) = a^*$

$(b^n a : n \geq 1) = b^*ba$

Regular expression: a* + bb*a



3. Convert the nfa defined by

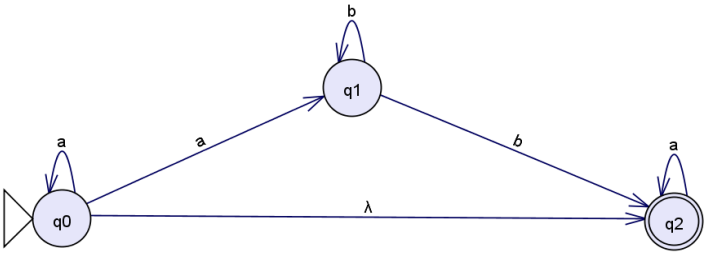
δ (q0, a) = {q0, q1}

δ (q1, b) = {q1, q2}

δ (q2, a) = {q2}

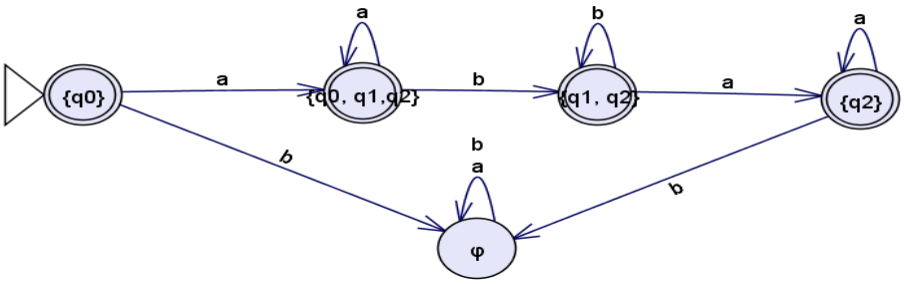
δ (q0, λ) = {q2}

with initial state q0 and final state q2 into an equivalent dfa.



		a	b
initial	{q0}	{q0, q1,q2}	φ
	{q1}	φ	{q1, q2}
Final	{q2}	{q2}	φ
	φ	φ	φ
Final	{q0, q1,q2}	{q0, q1,q2}	{q1, q2}
Final	{q1, q2}	{q2}	{q1, q2}

equivalent dfa:



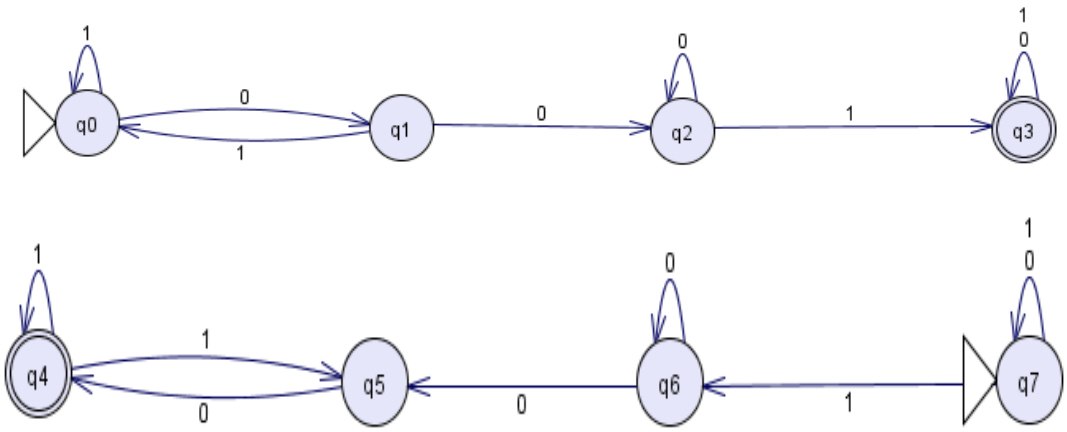
4. Show that if L is regular, so is L^R.

L is regular so it has a FSA.

FSA for L^R can be constructed:

1. Make one final state
2. Make final state initial
3. Make initial state final
4. Reverse all arrows

L^R has a FSA, so it is regular.



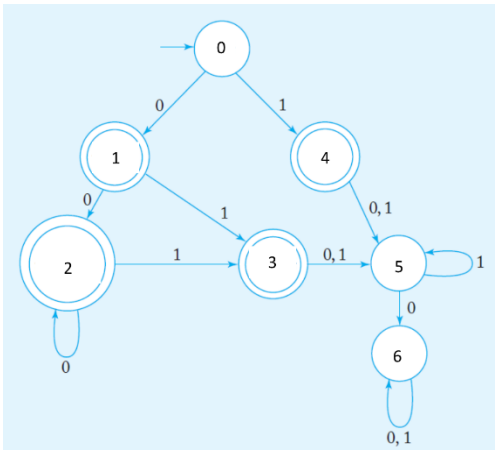
L = 001, 10001

L^R = 100, 10001

It is straightforward to see that the new nfa is equivalent to the original one.

Hence, if L is regular, so is L^R

5. Given the following dfa:



Find a minimal equivalent dfa.

	0	1
0	1	4
1(F)	2	3
2(F)	2	3
3(F)	5	5
4(F)	5	5
5	6	5
6	6	6

0- Equivalence = {0,5,6}{1,2,3,4}

{0,5,6}.0 = {1,6}

{0,5,6}.1 = {4,5,6}

----------因為 1,4 有包含在另一組所以需要分開

➔ {0},{5,6}/ {1,2,3,4}

{1,2,3,4}.0 = {2,5}

{1,2,3,4}.1 = {3,5}

----------因為 5 有包含在另一組所以需要分開

➔ {0},{5,6}/ {1,2},{3,4}

最後 = {0},{5,6}/ {1,2},{3,4}黃色是 final state