Automata Formal Languages & Logic

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Unit 1

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Minimization of DFA (Table Filling Algorithm)

- **In converting an NFA to a DFA, the DFA's states correspond to set of NFA states.**
- **In the worst-case, the construction can result in a DFA that is exponentially larger than the original NFA .**
- **Minimization of a DFA ensures that the resulting DFA (after minimization) has the least possible states.**
- **The advantages of having a minimal DFA are: Faster Execution: The more the number of states the more time the DFA will take to process a string, hence minimization ensures faster execution.**

Minimization of DFA (Table Filling Algorithm)

Step I : Eliminate Unreachable States

Step II : Mark Distinguishable Pair of States
(Final, Non-Final States)

Step III : If there are any Unmarked pairs (M, N) make
the following Check :
if δ(M, a) = X and δ(N, a) = Y&& (X, Y) is marked then,
Mark (M, N) also.
Repeat Step III until no new states can be marked.

Step IV : Combine all the unmarked pairs and make them a single state in the
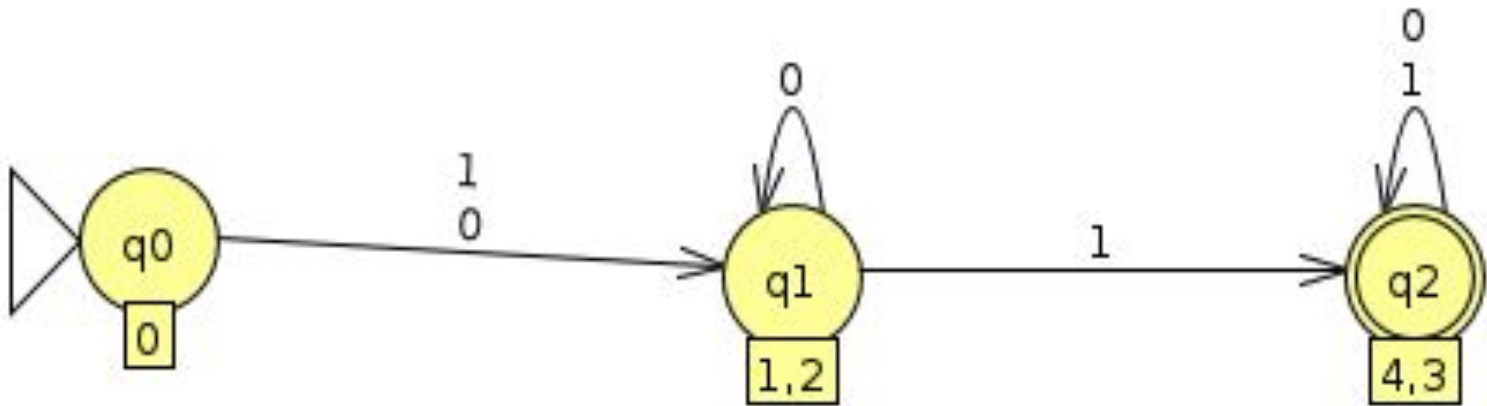minimized DFA.

Example 1:Minimize the following DFA.
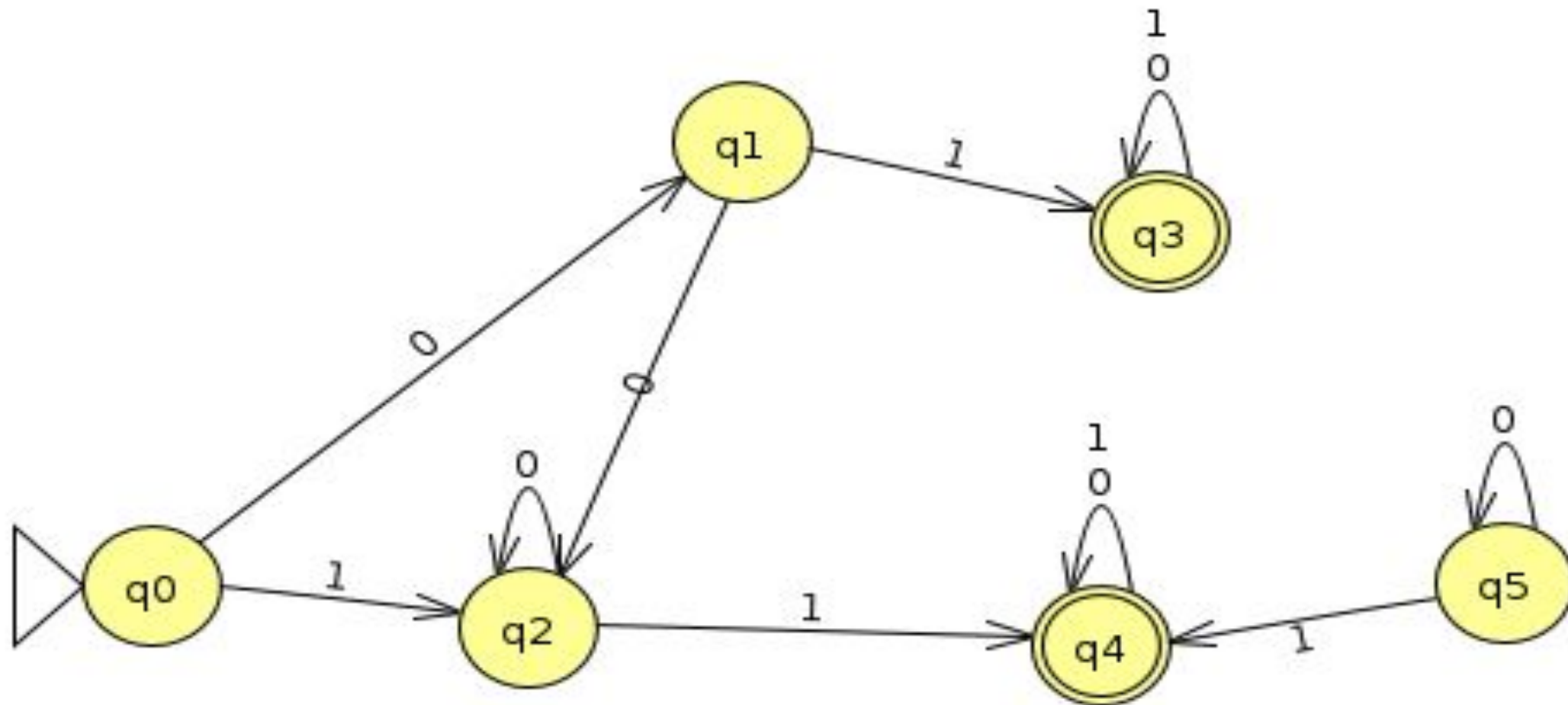
Solution:

Final Table

q1	X			
q2	X			
*q3	X	X	X	
*q4	X	X	X	
	q0	q1	q2	* q3

Minimized DFA

States merged :
- {q1, q2}
- {q3, q4}

Example 2 : Minimize the following DFA.
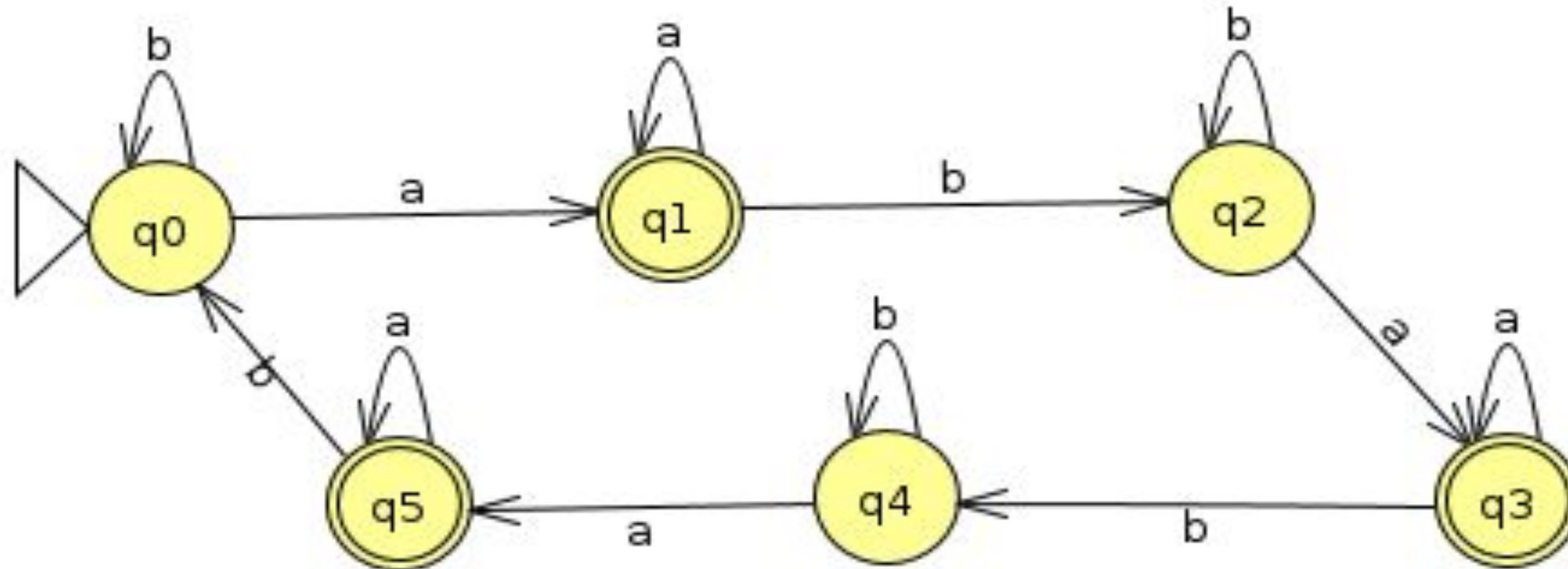
Solution:

Final Table

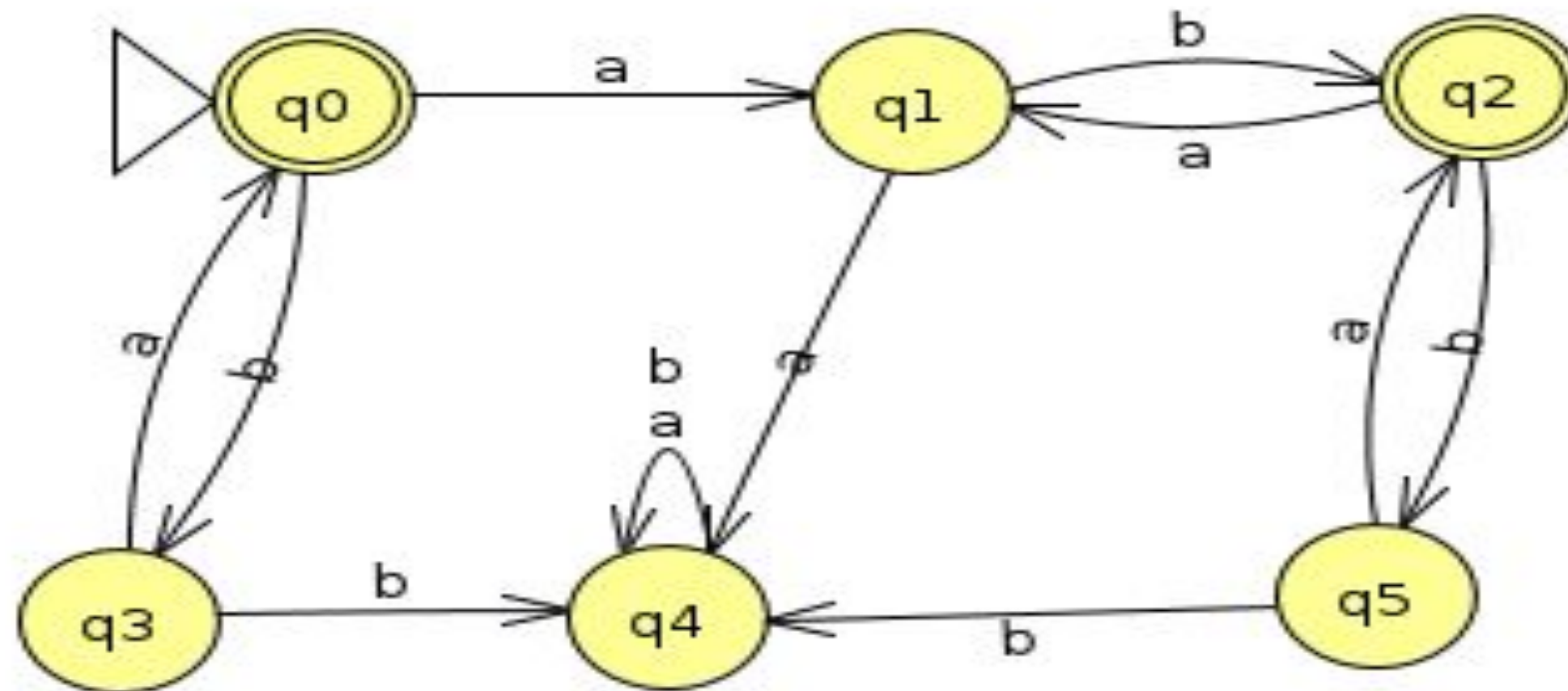|				
*q1	X			
q2		X		
*q3	X		X	
q4		X		X
*q5	X		X		X
	q0	*q1	q2	*q3	q4

Minimized DFA
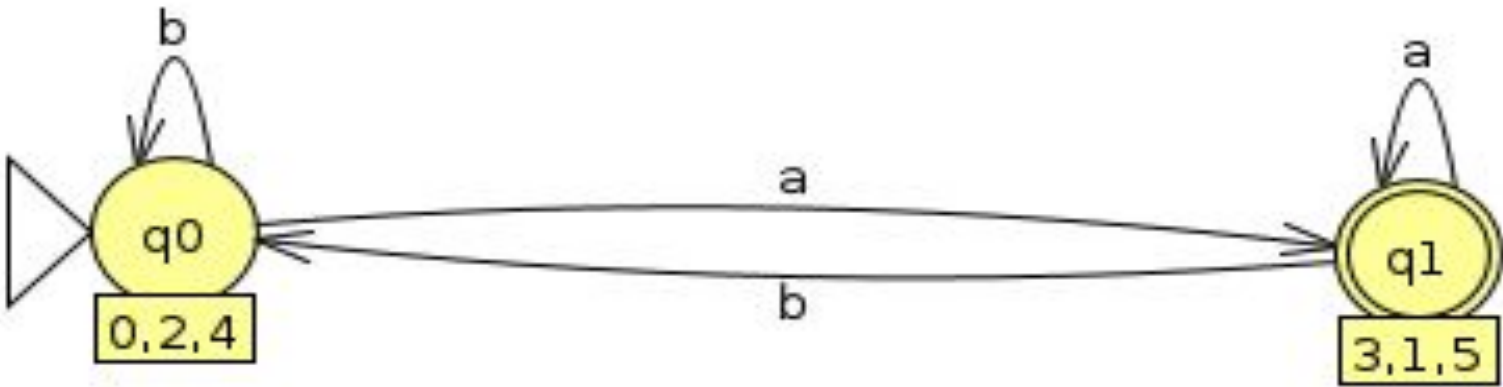
States merged :
- **{q0,q4}, {q0, q2} and {q2, q4}**
- **{q1,q5}, {q1,q3} and {q3,q5}**

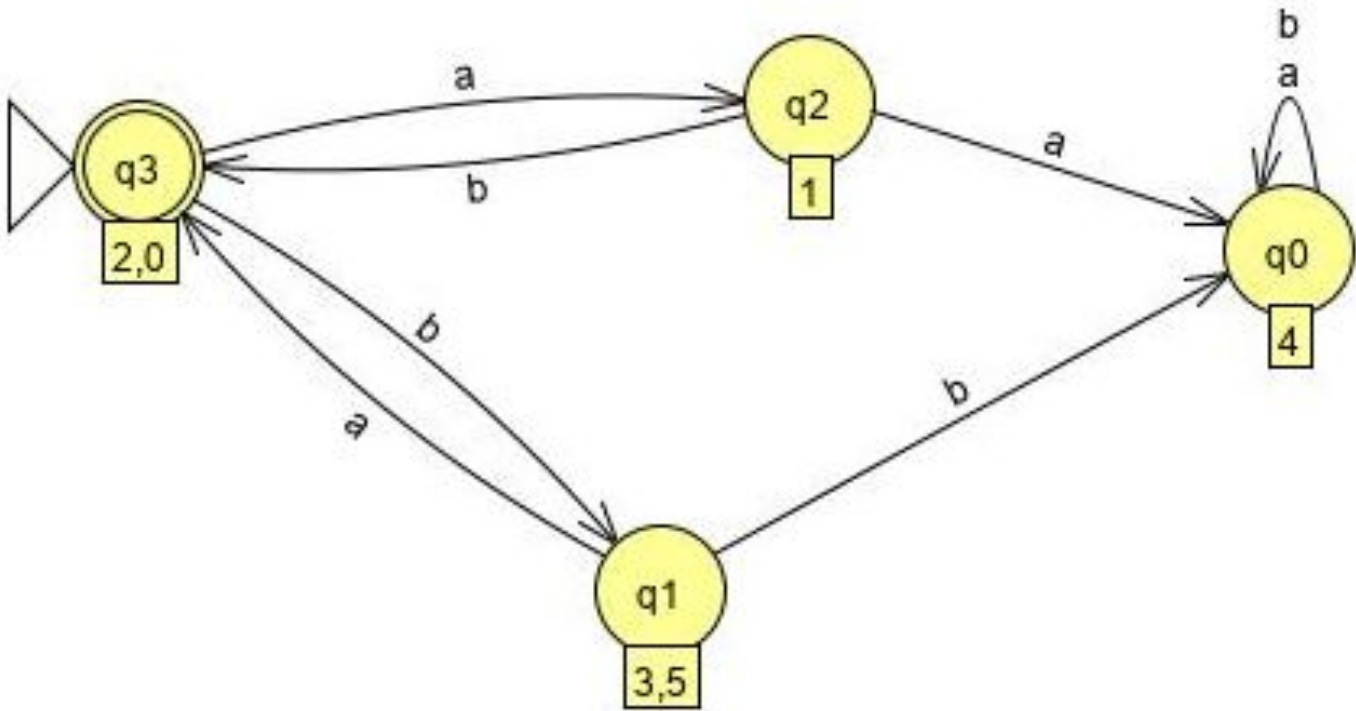**Example 3: Minimize the following DFA.**

Solution:

Minimized DFA

Final Table

q1	X				
q2		X			
q3	X	X	X		
q4	X	X	X		
q5	X	X	X		X
	q0	q1	q2	q3	q4

States merged :
- **{q0, q2}**
- **{q3, q5}**

THANK YOU

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