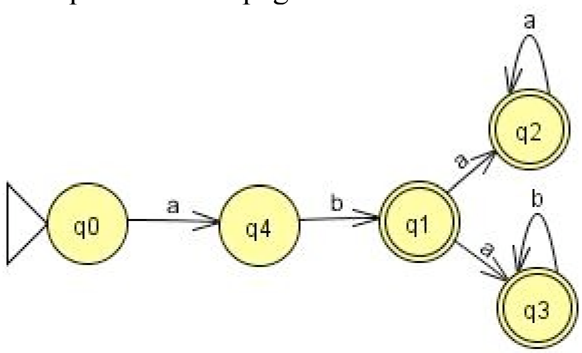
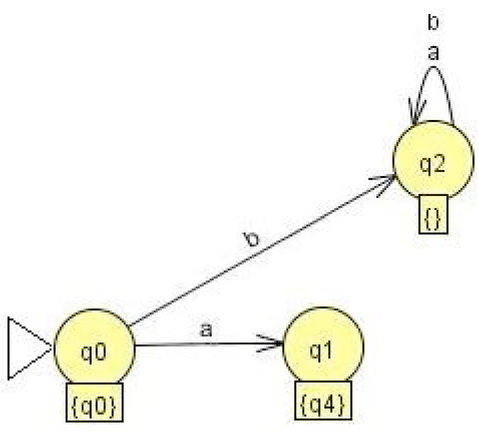
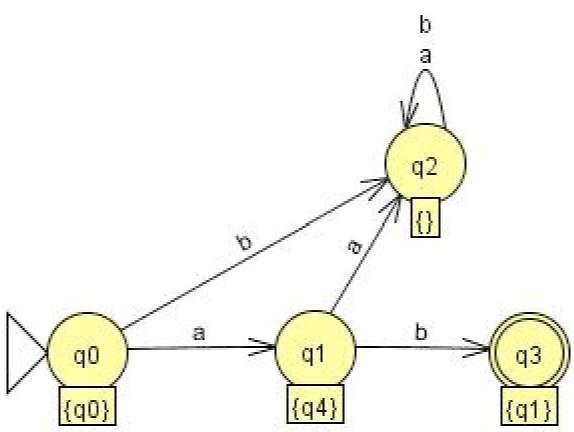
First problem 7 of page 55.



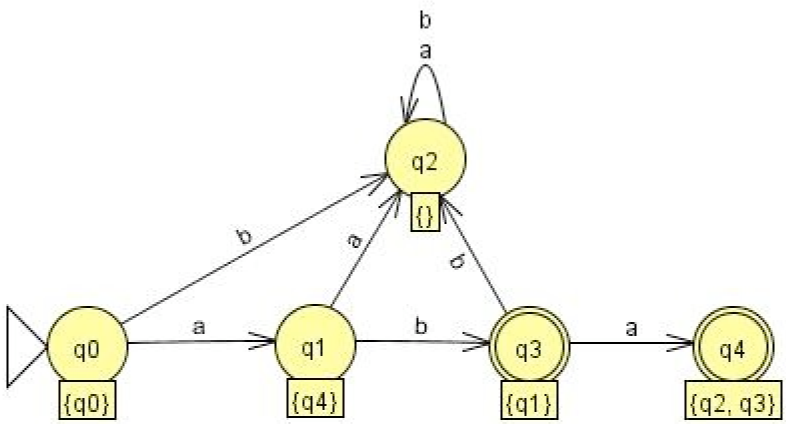
The starting state is {q0}. At a it goes to {q4}, while at b it goes to {}. {} as the ending trap state of course always points to itself.



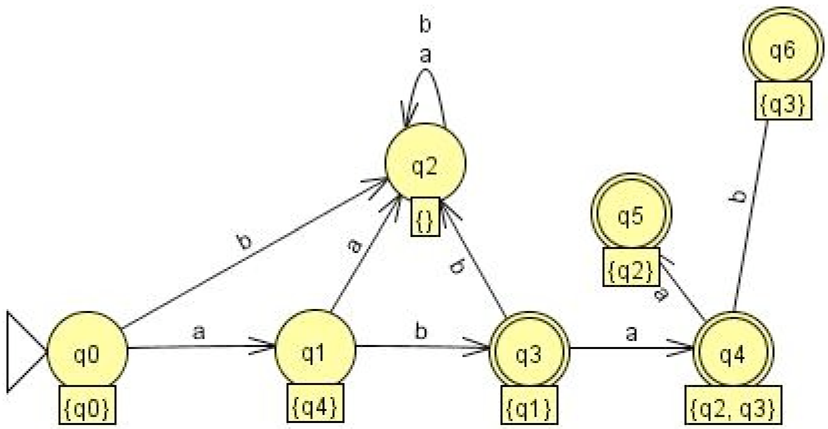
Next we look at state {q4}. At b it goes to state {q1} while at a it goes to {}. Since q1 is an ending state, {q1} is also an ending state.



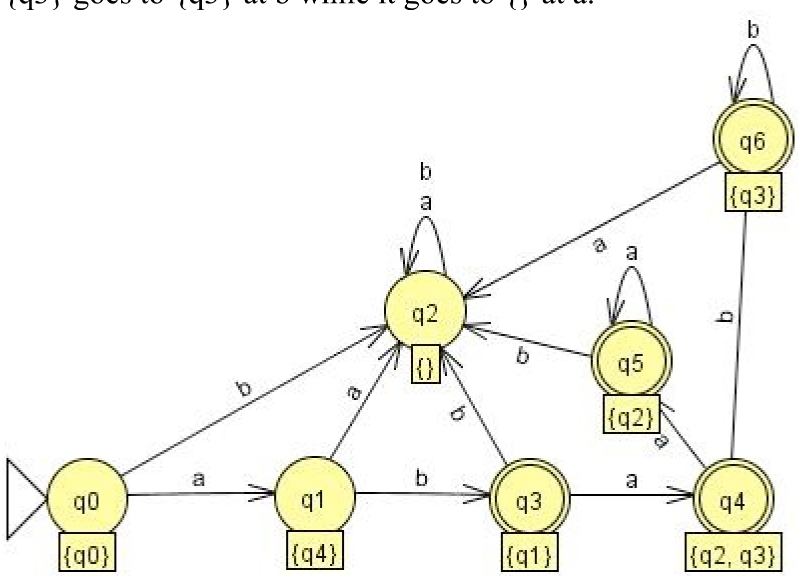
Next we look at {q1}. At a it goes to {q2, q3}. At b it goes to {}. Since both q2 and q3 are ending states, then {q2, q3} is also ending.



Next we examine {q2, q3}. At a it goes to {q2} while at b it goes to {q3}. Both of which are also final states.



Finally we examine the last two states. {q2} goes to {q2} at a while it goes to {} at b. {q3} goes to {q3} at b while it goes to {} at a.



With no new states to check, we are done. We could of course also throw all of the none used sets in and have them all point to {}, but that would make things look messy.

To minimize this DFA, we first make a matrix of all accessible states so we can mark them later,

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}							
{q0}							
{q1}							
{q2}							
{q3}							
{q4}							
{q2, q3}							

Next we X out distinguishables in the table tables if one state is a finishing state and the other isn't.

Check {}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}			X	X	X		X
{q0}							
{q1}	X						
{q2}	X						
{q3}	X						
{q4}							
{q2, q3}	X						

Check {q0}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}			X	X	X		X
{q0}			X	X	X		X
{q1}	X	X					
{q2}	X	X					
{q3}	X	X					
{q4}							
{q2, q3}	X	X					

Check {q1}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}			X	X	X		X
{q0}			X	X	X		X
{q1}	X	X				X	
{q2}	X	X					
{q3}	X	X					
{q4}			X				
{q2, q3}	X	X					

Check {q2}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}			X	X	X		X
{q0}			X	X	X		X
{q1}	X	X				X	
{q2}	X	X				X	
{q3}	X	X					
{q4}			X	X			
{q2, q3}	X	X					

Check {q3}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}			X	X	X		X
{q0}			X	X	X		X
{q1}	X	X				X	
{q2}	X	X				X	
{q3}	X	X				X	
{q4}			X	X	X		
{q2, q3}	X	X					

Check {q4}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}			X	X	X		X
{q0}			X	X	X		X
{q1}	X	X				X	
{q2}	X	X				X	
{q3}	X	X				X	
{q4}			X	X	X		X
{q2, q3}	X	X				X	

The description here is not the algorithm from the book but the answer is correct.

Then we check the remaining states and X out those which don't go to the same states on the same input commands.

Check {}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}		X	X	X	X	X	X
{q0}	X		X	X	X		X
{q1}	X	X				X	
{q2}	X	X				X	
{q3}	X	X				X	
{q4}	X		X	X	X		X
{q2, q3}	X	X				X	

Check {q0}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}		X	X	X	X	X	X
{q0}	X		X	X	X	X	X
{q1}	X	X				X	
{q2}	X	X				X	
{q3}	X	X				X	
{q4}	X	X	X	X	X		X
{q2, q3}	X	X				X	

Check {q1}

	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}		X	X	X	X	X	X
{q0}	X		X	X	X	X	X
{q1}	X	X		X	X	X	X
{q2}	X	X	X			X	
{q3}	X	X	X			X	
{q4}	X	X	X	X	X		X
{q2, q3}	X	X	X			X	

Check {q2}

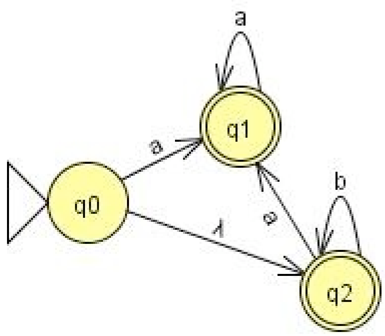
	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}		X	X	X	X	X	X
{q0}	X		X	X	X	X	X
{q1}	X	X		X	X	X	X
{q2}	X	X	X		X	X	X
{q3}	X	X	X	X		X	
{q4}	X	X	X	X	X		X
{q2, q3}	X	X	X	X		X	

Check {q4}

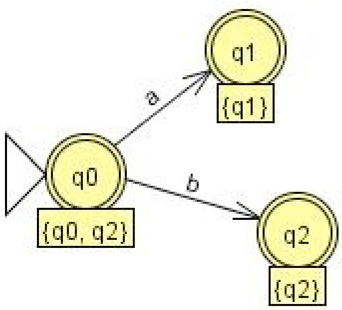
	{}	{q0}	{q1}	{q2}	{q3}	{q4}	{q2, q3}
{}		X	X	X	X	X	X
{q0}	X		X	X	X	X	X
{q1}	X	X		X	X	X	X
{q2}	X	X	X		X	X	X
{q3}	X	X	X	X		X	X
{q4}	X	X	X	X	X		X
{q2, q3}	X	X	X	X	X	X	

And it seems that this DFA cannot be reduced.

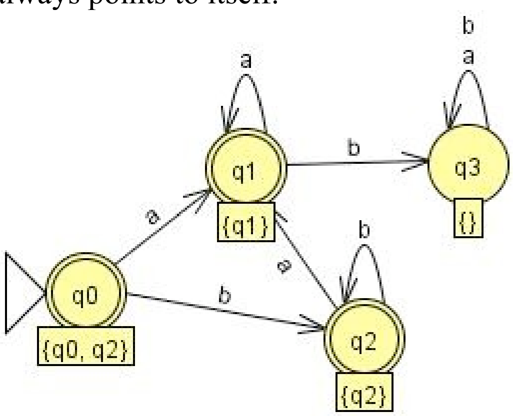
Now we shall consider problem 10a.



Since there is an empty set from q0 to q2, starting state is {q0, q2}. {q0, q2} goes to {q1} at a and {q2} at b. All of which currently mentioned states are ending states.



Then checking the next two states, {q1} goes to {q1} on a while it goes to {} on b. {q2} goes to {q1} on a while it goes to {q2} on b. And as always, the new introduced {} state always points to itself.



And since there is no state unaccounted for, we are done here. Now we move on to minimizing. We start off with the table like last time.

	{}	{q1}	{q2}	{q0, q1}
{}				
{q1}				
{q2}				
{q0, q2}				

Check each row and X out those that don’t match with final states

Check {q0}

	{}	{q1}	{q2}	{q0, q1}
{}		X	X	X
{q1}	X			
{q2}	X			
{q0, q2}	X			

The remaining steps have no change when checking.

Next we X out all which don't go to the same locations with input commands.

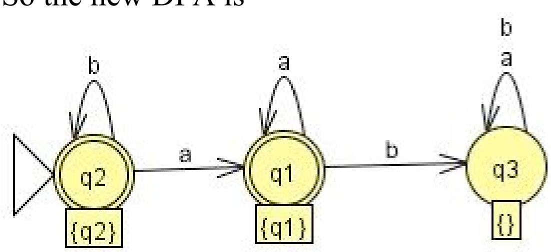
Check {q0}

	{}	{q1}	{q2}	{q0, q1}
{}		X	X	X
{q1}	X		X	X
{q2}	X	X		
{q0, q2}	X	X		

The remaining steps have no change when checking.

And we are done mapping the table. And the results are
{} = [{}]
{q1} = [{q1}]
{q2} = [{q2}, {q0, q2}]

So the new DFA is



Interestingly enough, this DFA looks exactly like the DFA I mentioned in problem 10b, that is if you ignore the {} state.