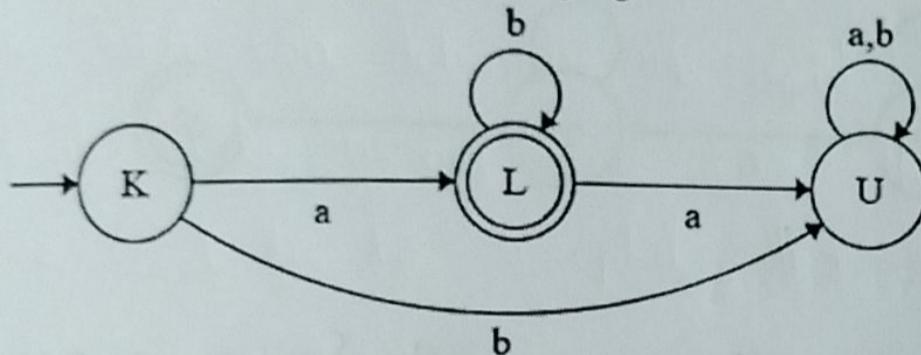


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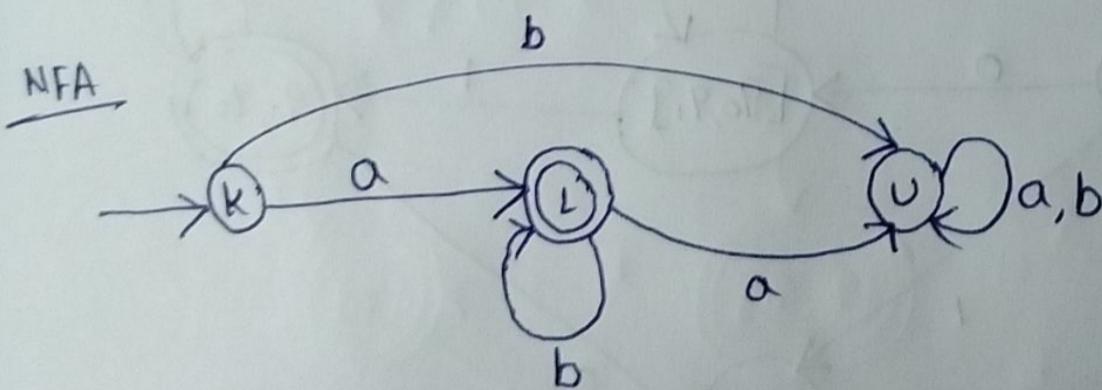
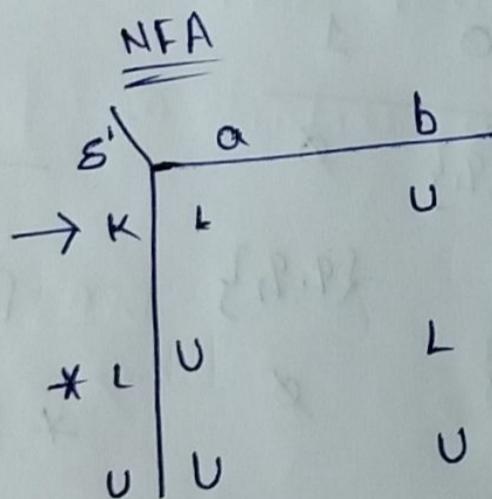
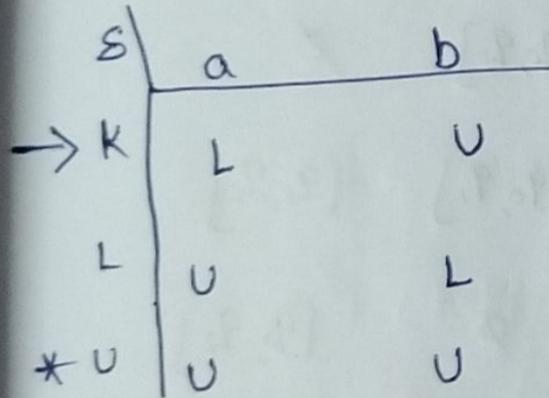
Pre-Tutorial (To be completed by student before coming to tutorial class)

1. The following DFA recognizes the language ab^* .



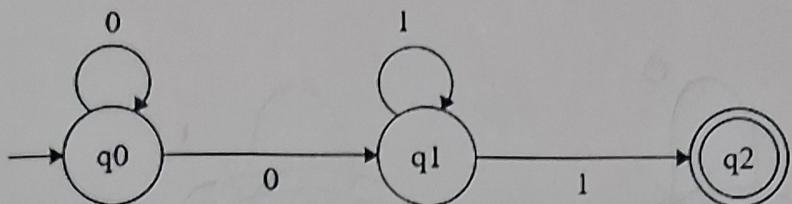
Find an equivalent NFA for the above given DFA. Write each step.

Solution: DFA



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2. Convert the following NFA to DFA.



Solution:

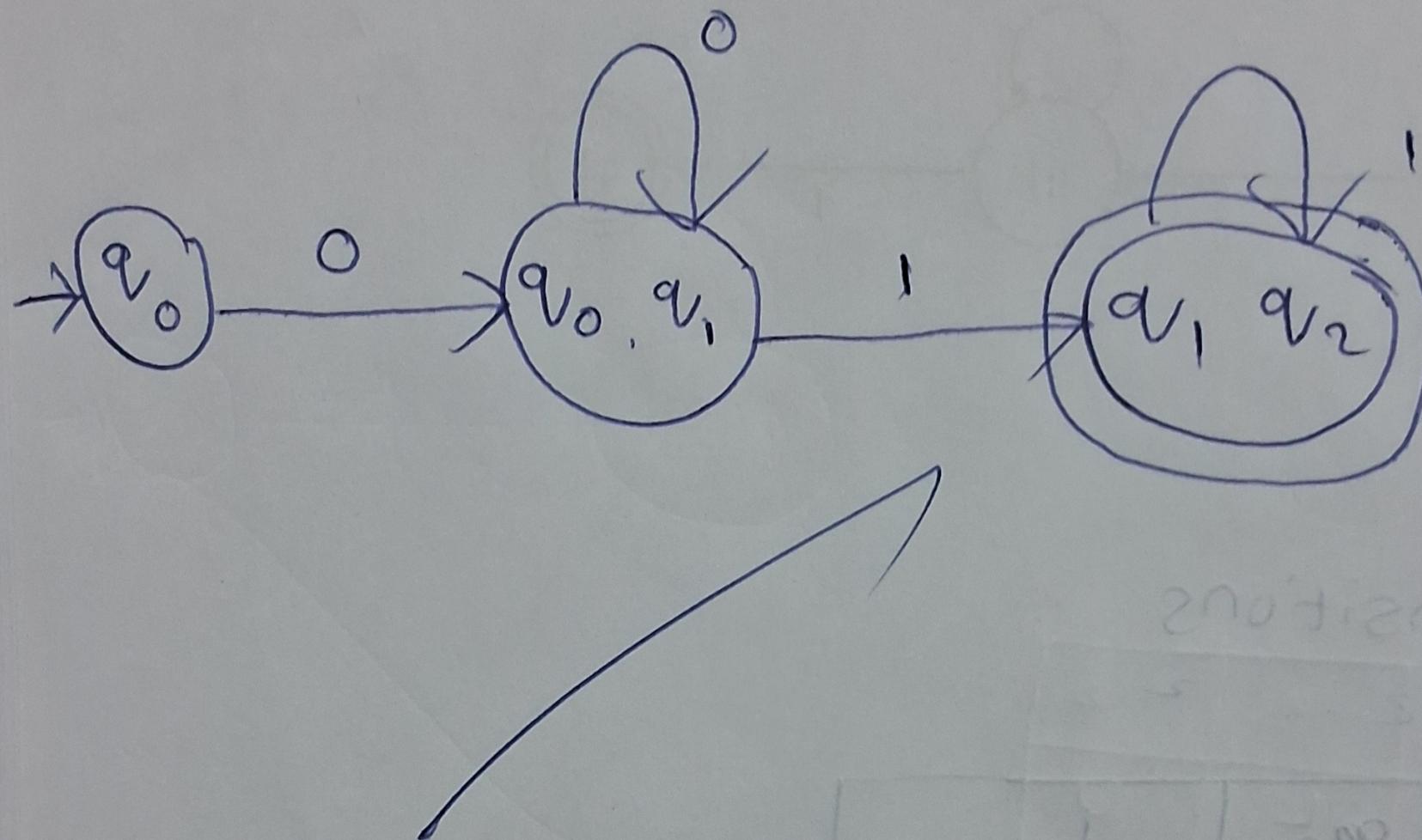
NFA Transitions

State	0	1
q_0	q_0, q_1	-
q_1	-	q_1, q_2
q_2	-	-

DFA Transitions

State	0	1
q_0	q_0, q_1	-
$q_0 q_1$	q_0, q_1	q_1, q_2
$q_1 q_2$	-	q_1, q_2

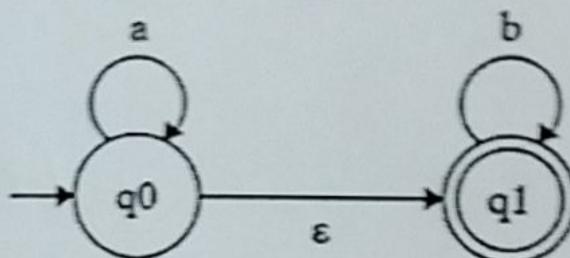
DFA diagram



end of answer

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3. Find the language recognized by the following NFA.



Construct an equivalent DFA. Write each step.

Solution:

$$L = \{ab, aab, aabb, aabbb, \dots\}$$

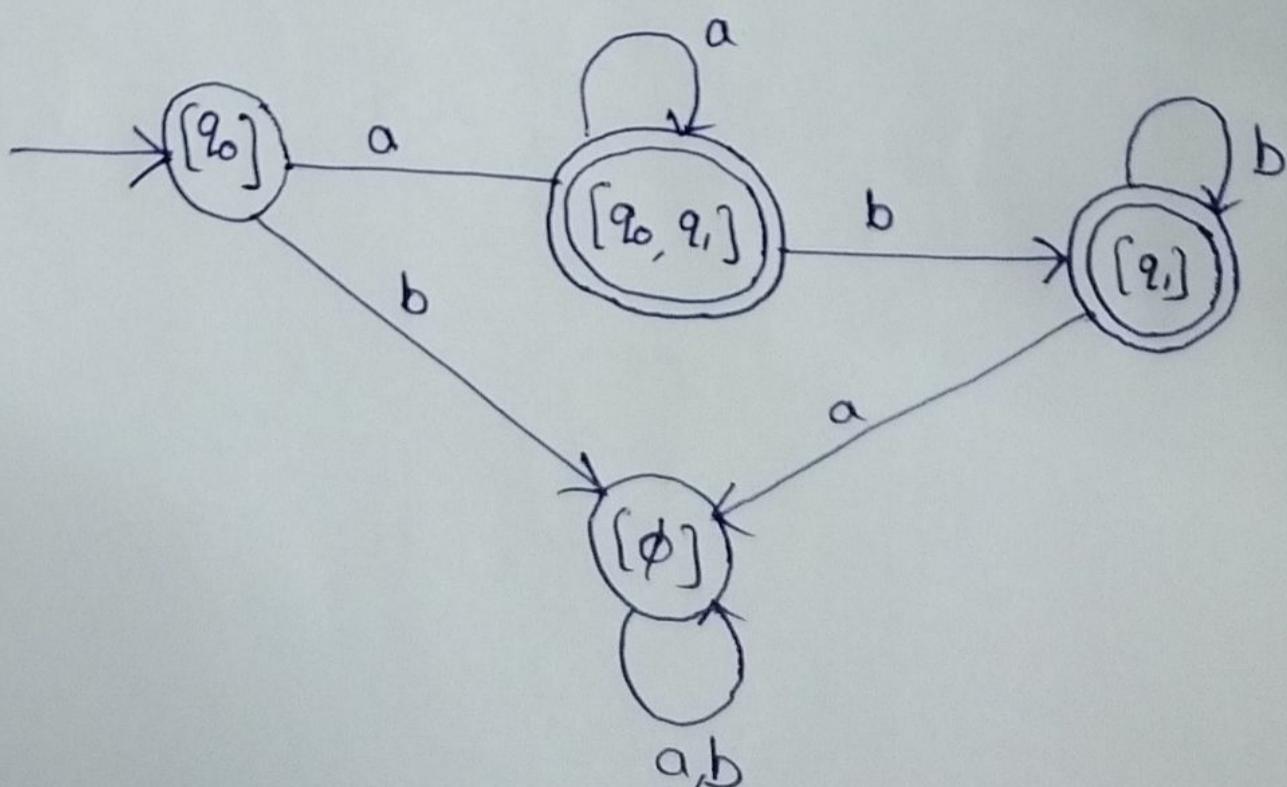
$L = \{\omega \mid \omega \text{ contains } a's \text{ followed by any No. of } b's\}$

NFA

δ'	a	b
$\rightarrow q_0$	$\{q_0, q_1\}$	\emptyset
$* q_1$	\emptyset	$\{q_1\}$

DFA

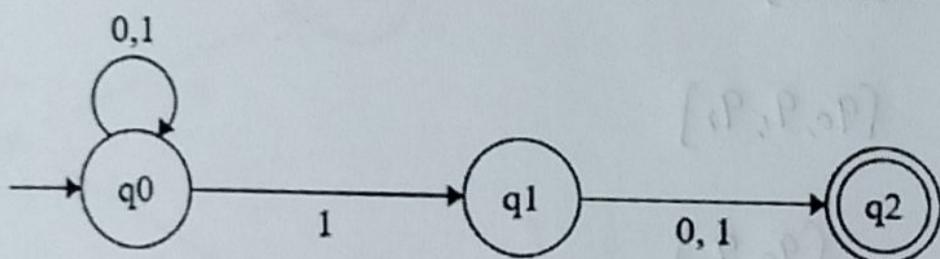
δ'	a	b
$\rightarrow [q_0]$	$[q_0, q_1]$	\emptyset
$* [q_0, q_1]$	$[q_0, q_1]$	$[q_1]$
$* [q_1]$	\emptyset	$[q_1]$



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IN-TUTORIAL (To be carried out by student in presence of faculty in classroom)

1. Find the language recognized by the following finite automaton.



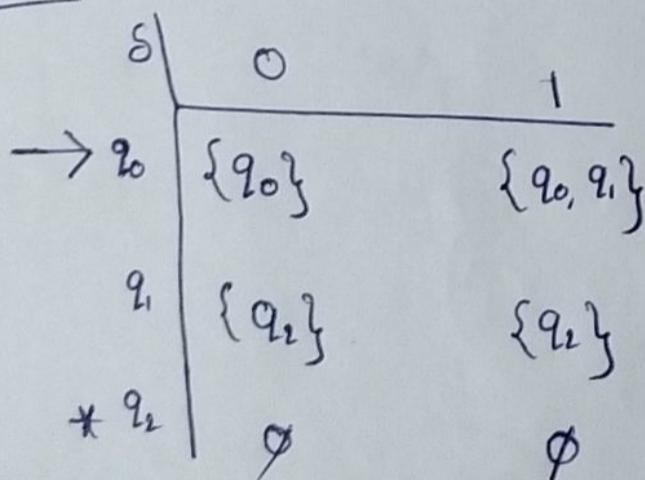
Construct an equivalent DFA for the above given automaton.

Solution:

$$L = \{011, 111, 010, 11100, \dots\}$$

$L = \{\omega | \omega \text{ contains any no. of zeroes or one's followed by 1 any no. of zeroes or one's}\}$

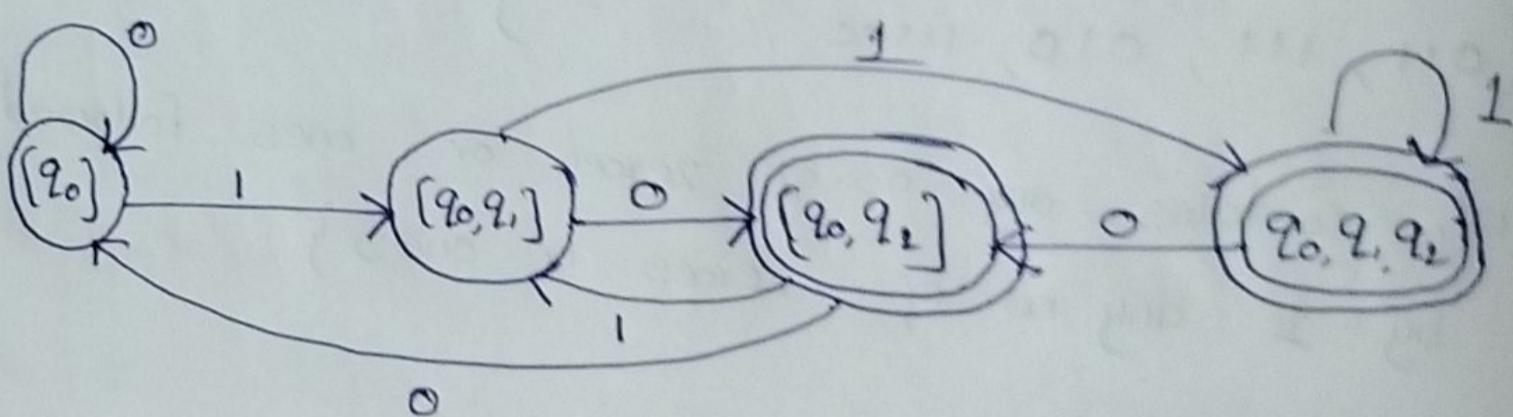
NFA



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Date	<TO BE FILLED BY STUDENT>	Student Name	G. Rajesh

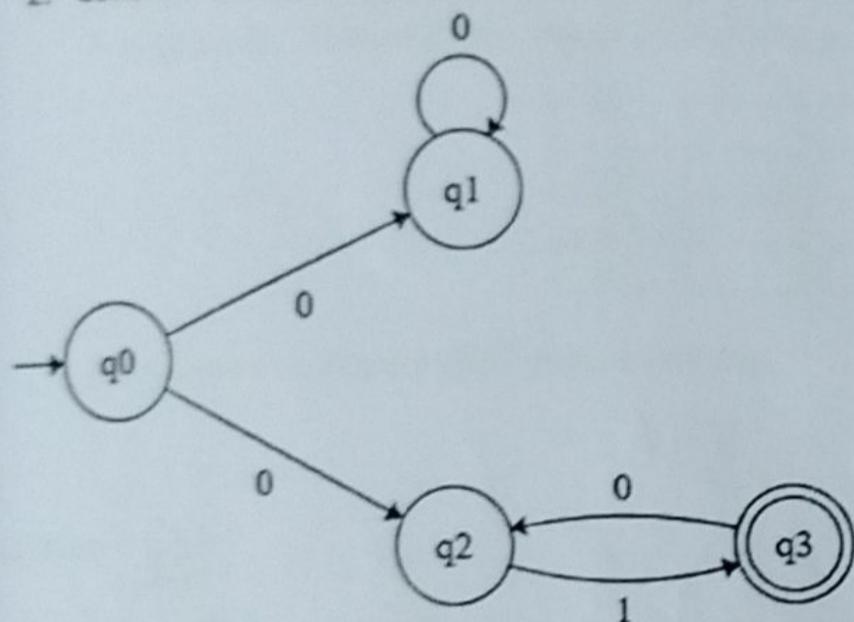
DFA

S'	0	1
$\{q_0\}$	$\{q_0\}$	$\{q_0, q_1\}$
$\{q_0, q_1\}$	$\{q_0, q_1\}$	$\{q_0, q_1, q_2\}$
$* \{q_0, q_1\}$	$\{q_0\}$	$\{q_0, q_1\}$
$* \{q_0, q_1, q_2\}$	$\{q_0, q_1\}$	$\{q_0, q_1, q_2\}$



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Date	<TO BE FILLED BY STUDENT>	Student Name	<TO BE FILLED BY STUDENT>

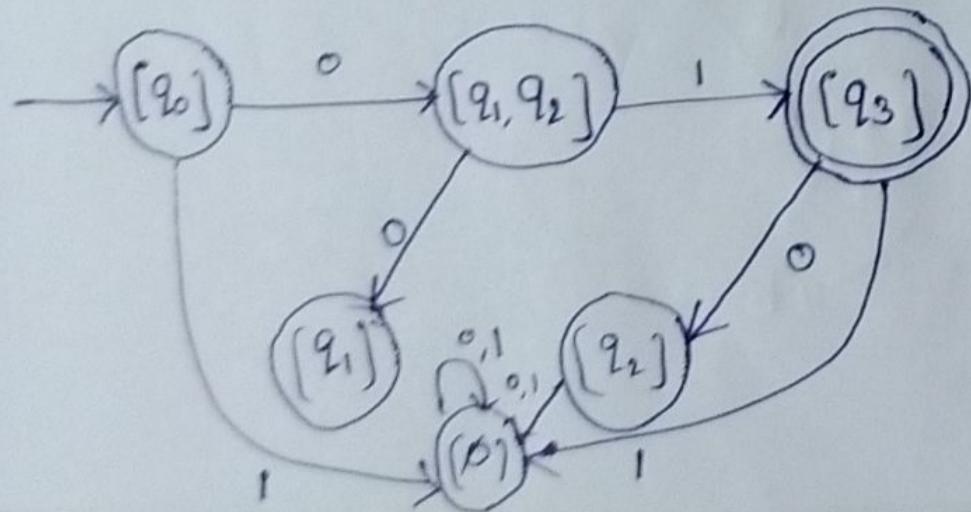
2. Consider the following NFA that recognizes language L.



Construct an equivalent DFA for the above NFA. Write each step.

Solution:

<u>NFA</u>		<u>DFA</u>	
δ	0	δ	0
q ₀	$\{q_1, q_2\}$	$[q_0]$	$[q_1, q_2]$
q ₁	$\{q_1\}$	$[q_1, q_2]$	$[q_1]$
q ₂	\emptyset	$[q_3]$	$[q_3]$
*q ₃	$\{q_2\}$	\emptyset	\emptyset



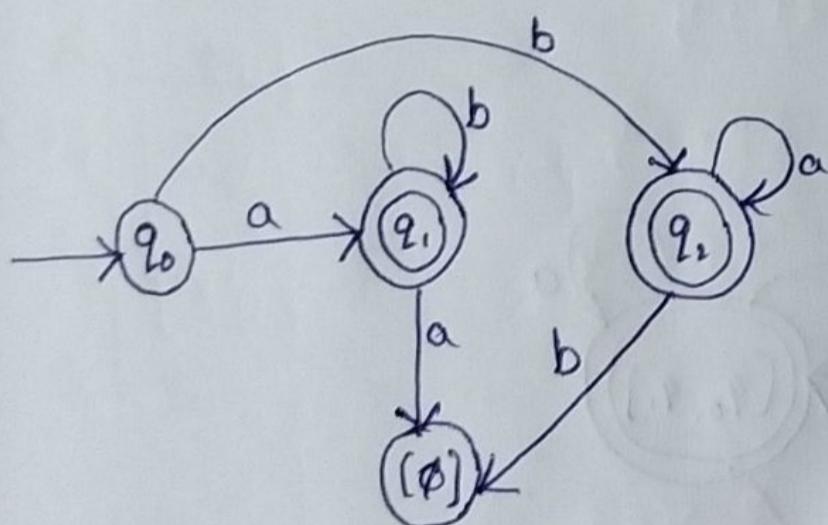
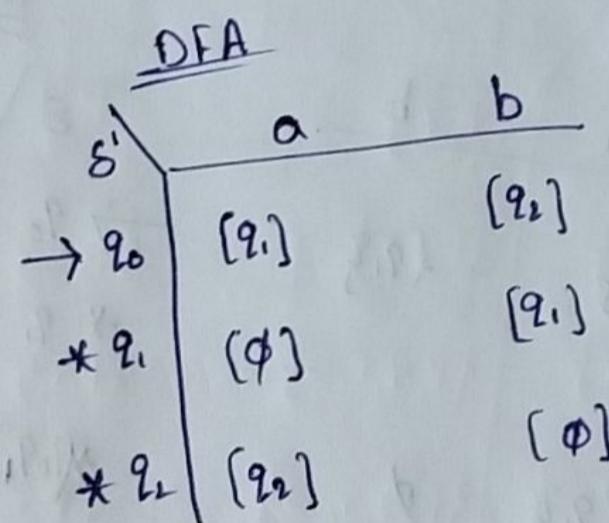
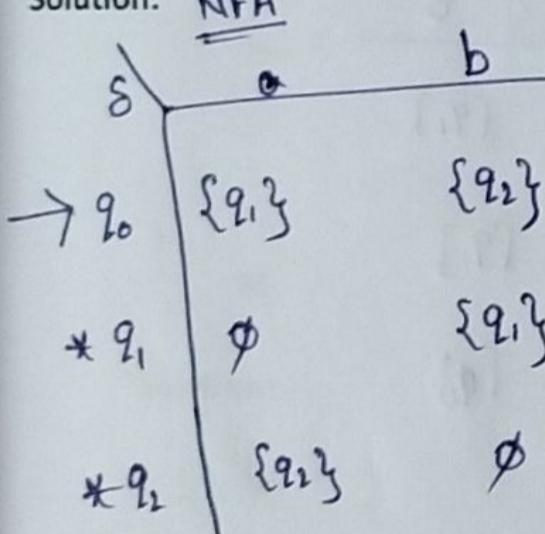
Tutorial #	<TO BE FILLED BY STUDENT>	Student ID	<TO BE FILLED BY STUDENT>
Date	20-8-24	Student Name	B. Tejesh

3. Consider an NFA with three states, $Q = \{q_0, q_1, q_2\}$, two input symbols, $\Sigma = \{a, b\}$, and $F = \{q_1, q_2\}$. The transition function is defined as follows:

	a	b
q_0	q_1	q_2
q_1	\emptyset	q_1
q_2	q_2	\emptyset

Construct an equivalent DFA? Write each step.

Solution:



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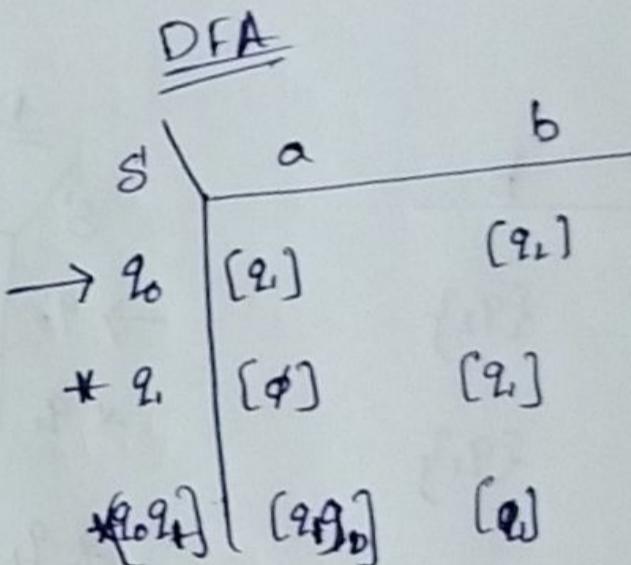
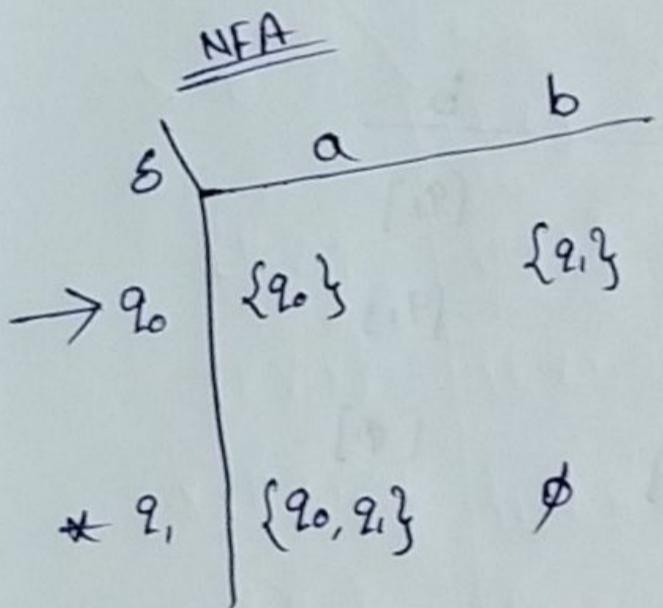
Post-Tutorial (To be carried out by student after Tutorial session is over)

1. Consider an NFA with two states, $Q = \{q_0, q_1\}$, two input symbols, $\Sigma = \{a, b\}$, and δ .
The transition function is defined as follows:

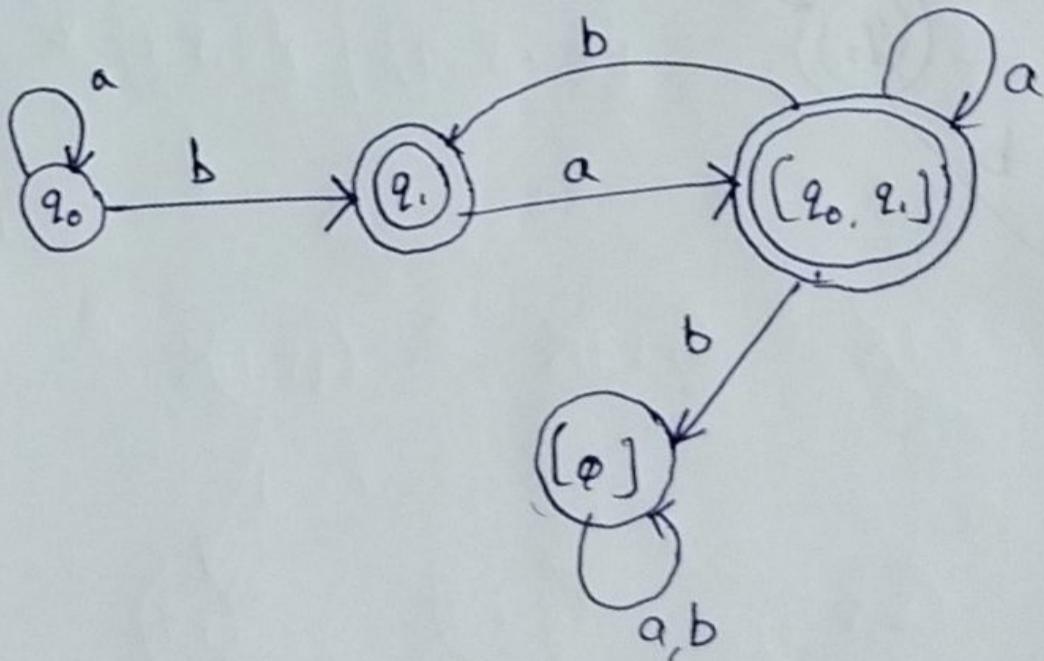
	a	b
q_0	q_0	q_1
q_1	$\{q_0, q_1\}$	\emptyset

Construct an equivalent DFA. Write each step.

Solution:

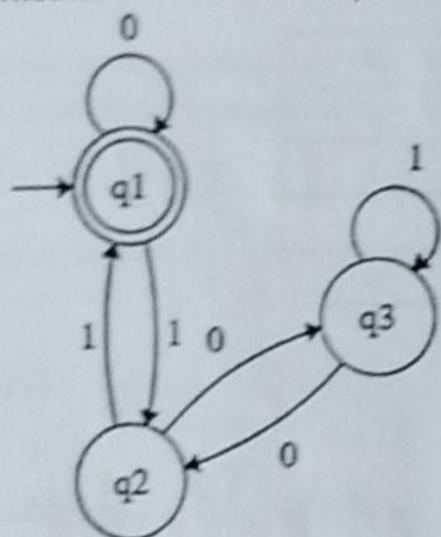
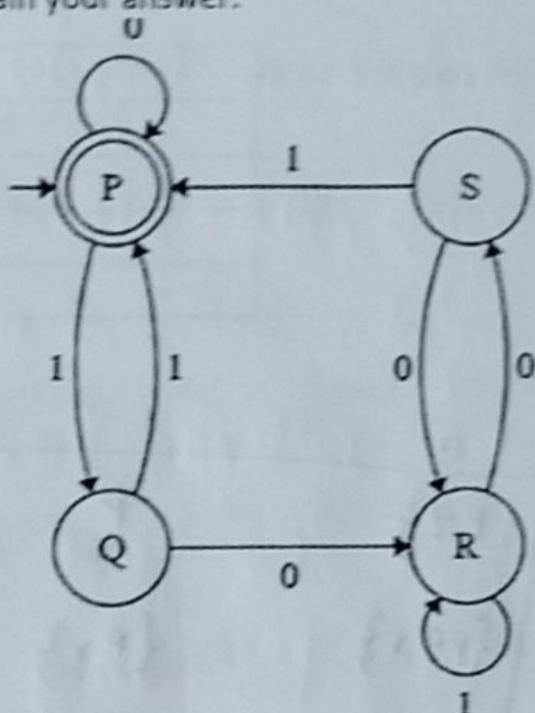


Result DFA

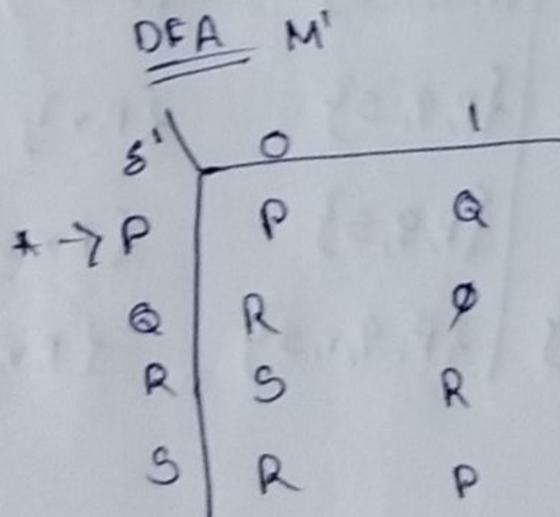
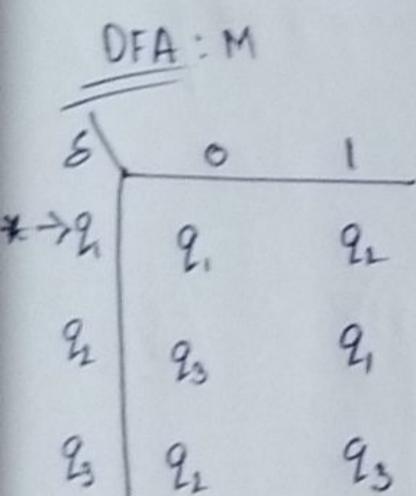


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2. Consider the following two DFAs M and M' over $\{0, 1\}$ given in the following figure. Determine whether M and M' are equivalent. Explain your answer.

 M  M'

Solution:



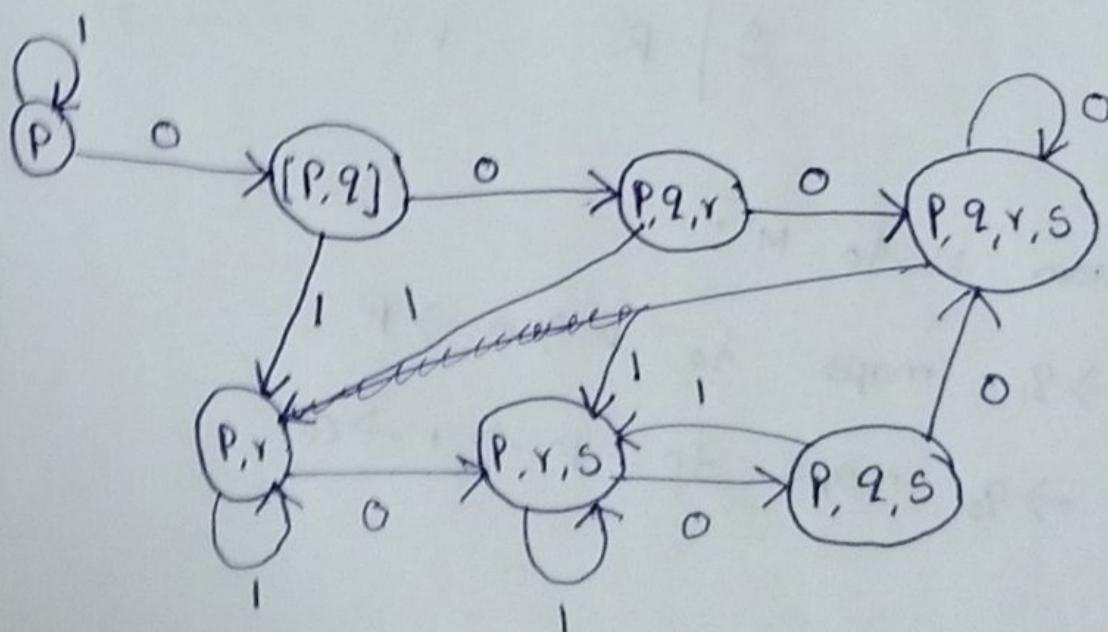
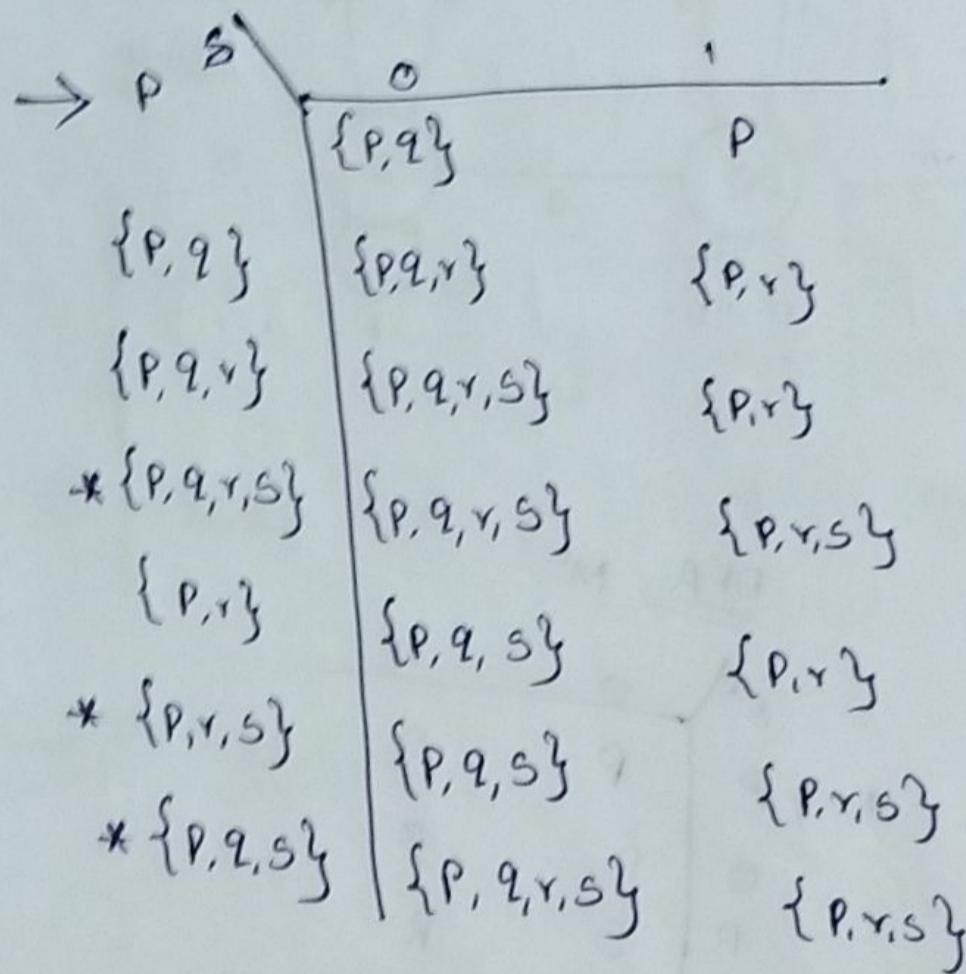
Let map states from M to M' :

$$\begin{array}{l}
 q_1 \rightarrow P \\
 q_2 \rightarrow Q \\
 q_3 \rightarrow S
 \end{array}
 \quad
 \left| \begin{array}{l}
 q_1 \xrightarrow{0} q_1 \text{ maps to } P \xrightarrow{0} P \\
 q_1 \xrightarrow{1} q_2 \text{ maps to } P \xrightarrow{1} Q \\
 q_1 \xrightarrow{1} q_2 \text{ maps to } P \xrightarrow{1} Q
 \end{array} \right.$$

3. Convert the following NFA to its equivalent DFA where $\{(p, q, r, s), \{0,1\}, d, p, \{s\}\}$ where d is the transition function.

d	0	1
p	p, q	p
q	r	r
r	s	-
s	s	s

Solution:



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Viva Questions:

4. What is the equivalence theorem for NFAs and DFAs? How does it ensure that any NFA can be converted to an equivalent DFA, and vice versa?

Answer:

Equivalence Theorem:-

NFA and DFA's recognize the same set of languages (regular languages). Any NFA can be converted to an equivalent DFA by simulating all possible computation paths simultaneously using DFA states representing set of NFA states.

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5. How is the equivalence of NFAs and DFAs used in compiler design? Provide an example. A compiler uses this equivalence to recognize and parse programming languages.

Answer: Equivalence in Compiler design!

Compiler leverage NFA-DFA equivalence to construct efficient lexical analyzers. NFAs are used to model token patterns flexibly, then converted to DFAs for fast and deterministic token recognition during lexical analysis.

(For Evaluator's use only)

Comment of the Evaluator (if Any)	Evaluator's Observation Marks Secured: _____ out of <u>50</u> Full Name of the Evaluator: Signature of the Evaluator Date of Evaluation:
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