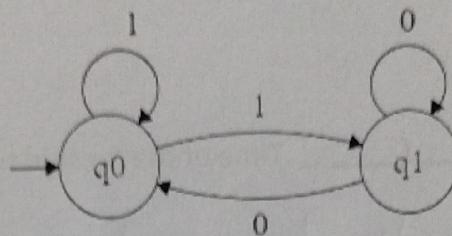


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Date	TO BE FILLED BY STUDENT	Student Name	M·KOUJSHEK

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

1. Is the following transition diagram a DFA? Explain.



Solution:

No, the following is not a DFA

Because

- 1) There is no final state in the diagram
- 2) q_0 has 2 transition on '1' & has no transition on '0'
- 3) q_1 , has 2 transition on '0' & has no transition on '1'

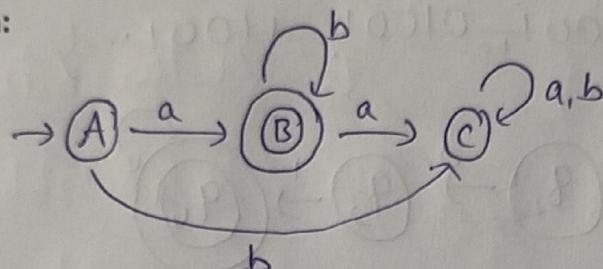
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2. What is the language recognized by the following DFA? The initial state is 'A' and final or accepting state is 'B'. Draw the DFA and explain learner answer.

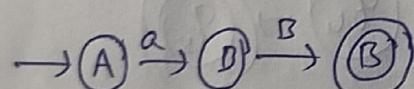
State	a	b
A	B	C
B	C	B
C	C	C

Solution:



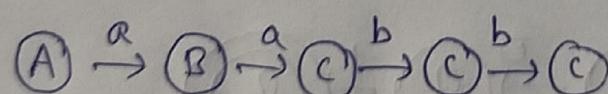
$L = \{w | w \text{ contains only one 'a'. starting followed by any number of 'b's}\}$

string ab



B is a final state, it is accepted

solving aabb



It is not final state, so it is Rejected

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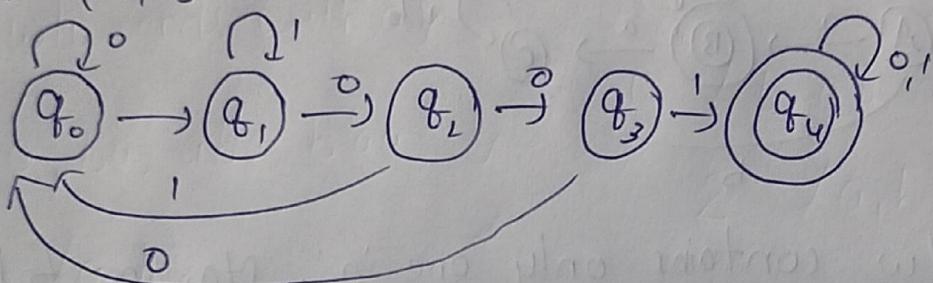
3. Construct a DFA that accepts the language

$$L = \{w \in \{0,1\}^*: w \text{ contains } 1001\}$$

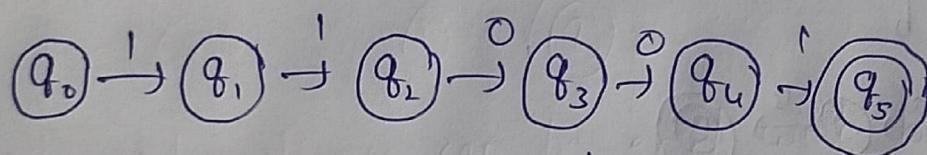
Solution:

$L = \{w | w \text{ has sub string } 1001\}$

$\Sigma = \{0, 1\}$ $C = \{1001, 01001, 11001\}$

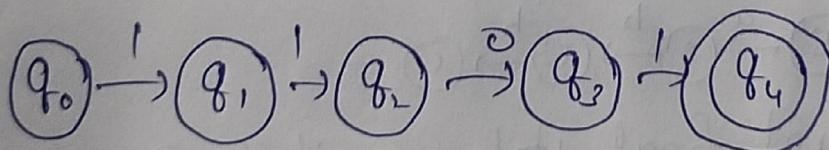


String 11001



q_5 is final state so, it is accepted

String 1101



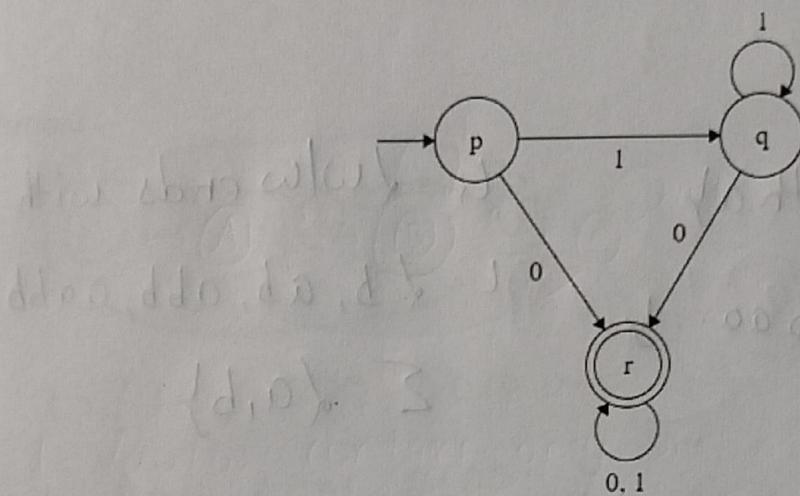
q_0 is not final state so, it is Rejected

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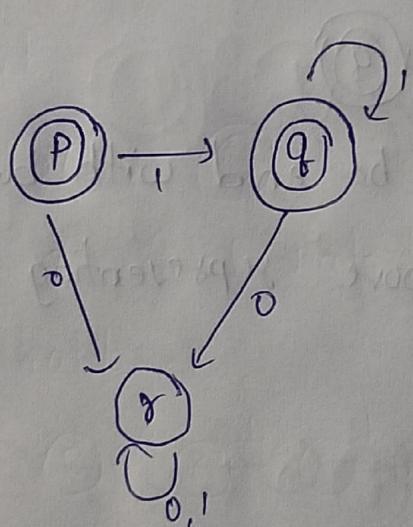
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IN-TUTORIAL (To be carried out by student in presence of faculty in classroom)

1. Find the complement of the language accepted by the following DFA:

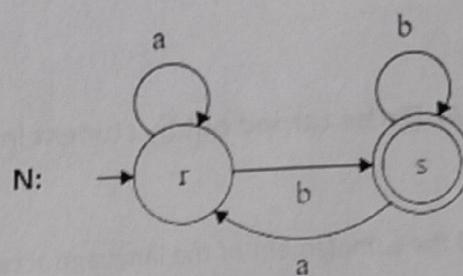
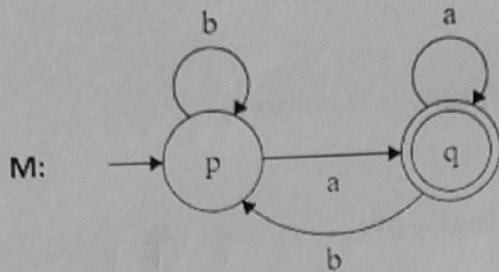


Solution:



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2. Consider the DFAs M and N given below. Construct a DFA that accepts the language $L(M) \cap L(N)$.



Solution:

$$L_1 = \{w | w \text{ ends with } ab\}$$

$$L_2 = \{a, ba, ab, baa, \dots\}$$

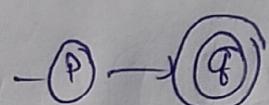
$$\Sigma = \{a, b\}$$

$$L_1 = \{w | w \text{ ends with } ab\}$$

$$L_2 = \{a, ab, abb, aabb, \dots\}$$

$$\Sigma = \{a, b\}$$

$$L_1 \cap L_2 = \emptyset$$

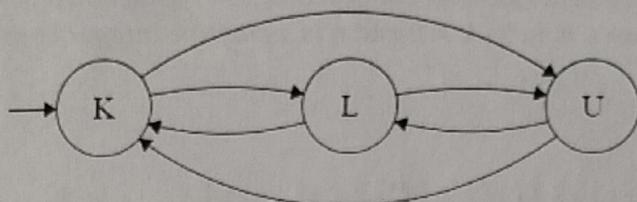


Here, No string can be end with both 'a' & 'b'

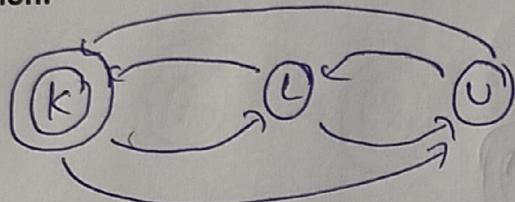
So the DFA is above representing as \emptyset

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3. Consider the following DFA that accepts the language L. Draw a DFA that is obtained by reversal of the given DFA.



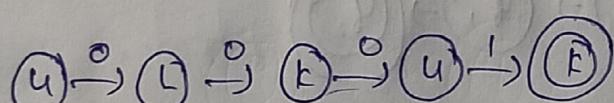
Solution:



$L = \{110, 1000, 0010 \dots\}$

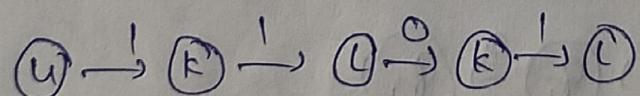
$L = \{011, 0001, 0100 \dots\}$

String 0001



K is a final state so, it is accepted

String 1101



L is not final state so, it is rejected

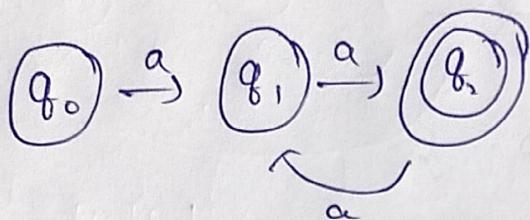
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4. Design a DFA for the language $L = \{a^{nk} \mid k > 0 \text{ and } n \text{ is a positive integer constant}\}$ for $\Sigma = \{a\}$.

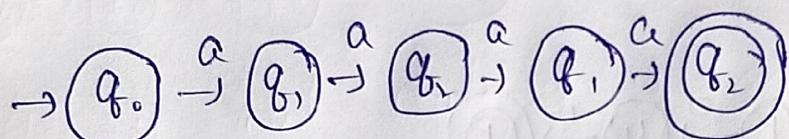
Solution:

$$n=2 \\ L = \{a^2, a^4, a^6, \dots\}$$

$$\Sigma = \{a\}$$

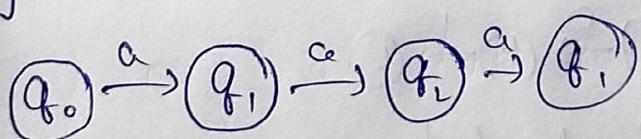


string - a^4



q_3 is final state so, it is accepted

string - a^3



q_1 is not final state so, it is rejected

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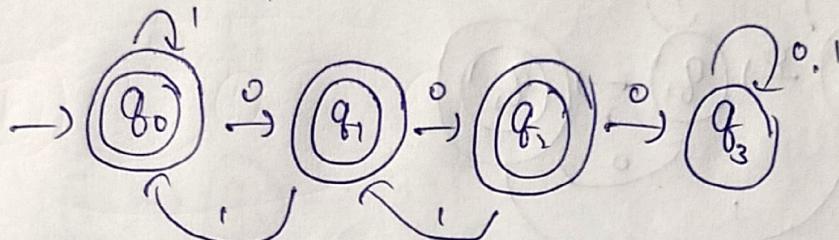
5. Design a DFA for the following:

Consider the set of strings on $\{0,1\}$ in which, every substring of 3 symbols has at most two zeros. For example, 001110 and 011001 are in the language, but 100010 is not. All strings of length less than 3 are also in the language.

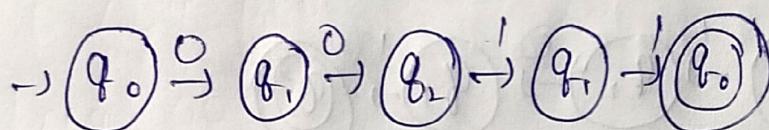
Solution:

$$L = \{001110, 011001, 101\ldots\}$$

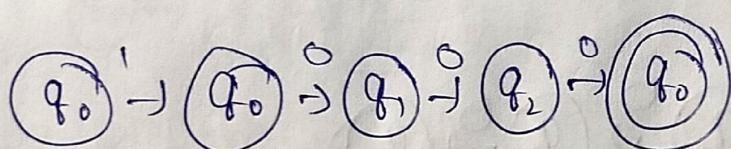
$$\Sigma = \{0, 1\}$$



String: -0011
 q_0 is final state so, it is accepted



String: - 1000



q_0 is not final state so, it is rejected

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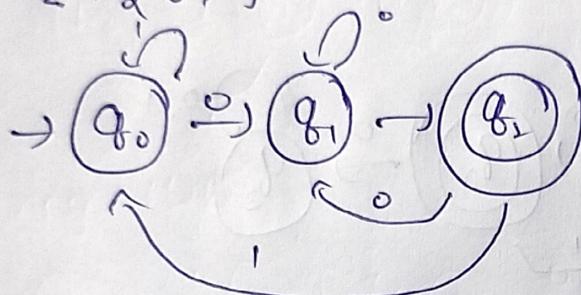
Post-Tutorial (To be carried out by student after tutorial session is over)

1. Draw a DFA for the language accepting strings ending with '01' over input alphabets $\Sigma = \{0, 1\}$

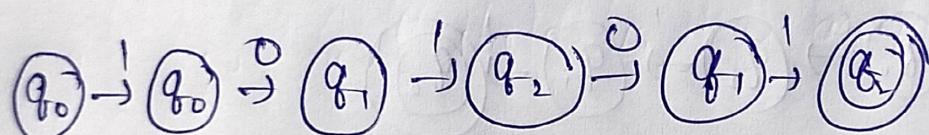
Solution:

$$L = \{01, 001, 1001, 0101, \dots\}$$

$$\Sigma = \{0, 1\}$$

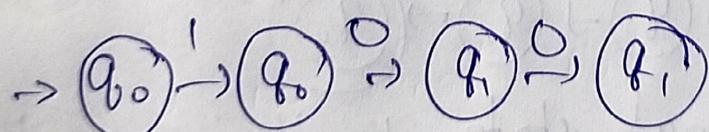


string 10101



q_2 is final state it is accepted

string 100



q_1 is not final state so rejected

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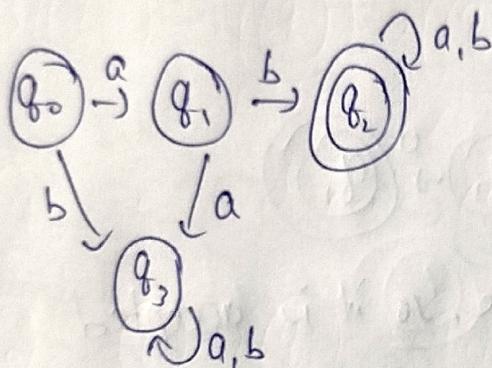
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2. Draw a DFA for the language accepting strings starting with 'ab' over input alphabets $\Sigma = \{a, b\}$

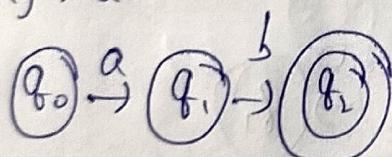
Solution:

$$L = \{ab, aba, abb, abab, \dots\}$$

$$\Sigma = \{a, b\}$$

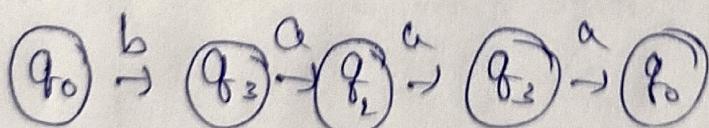


string: ab



q_2 is final state it is accepted

string: baac

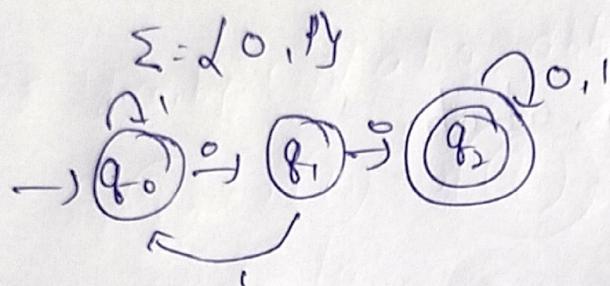


It is rejected

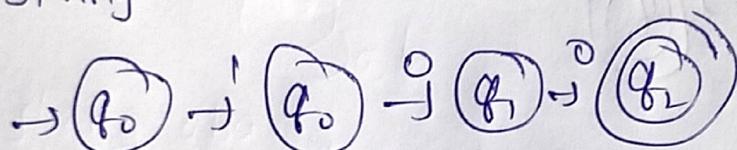
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3. Draw a DFA for the language accepting strings having 2 consecutive 0's over input alphabets $\Sigma = \{0, 1\}$.
 Ex: 0011, 1001, 1100, 111001100100, and 100001 are all accepted strings.

$L = \{00, 0011, 1001, 1100, \dots\}$

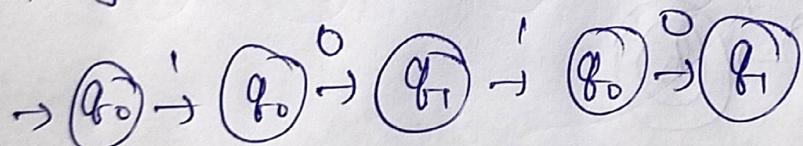


String 100



q_2 is final state, so it is accepted

String: 1010



q_1 is not final state so it is rejected

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Viva Questions:

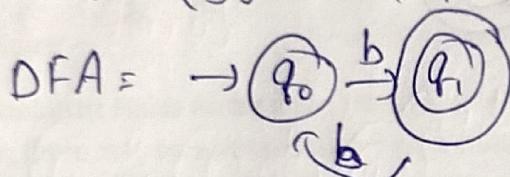
1. What is the significance of the initial state and final state in a DFA? How do these states impact the acceptance or rejection of input strings by the DFA? Provide examples to illustrate your answer.

Solution:

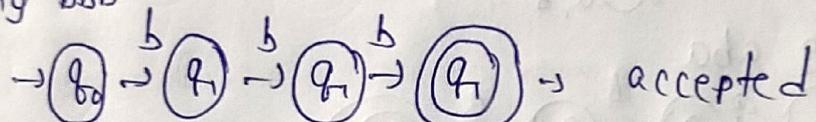
The starting state in the DFA is initial state
Destination in the DFA is final state

Ex: $L = \{w | w \text{ contains } 000 \text{ No of } b\}$

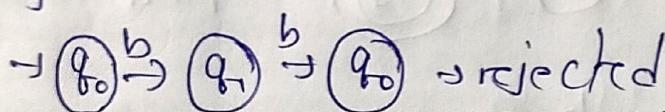
$$\Sigma = \{b\} \quad L = \{b, bbb, \dots\}$$



String bbb



String bb



2. How does the transition function in a DFA determine the next state based on the current state and input symbol? Provide a detailed explanation of the transition function and its role in the DFA.

Solution:

'A' is represented by 5-types

$$M = (Q, \Sigma, q_0, \delta, F)$$

where Q = is finite set of state

Σ = is finite input of alphabet

q_0 = is a finite state, $q_0 \in Q$

F = is a set of finite state, $F \subseteq Q$

$$\delta = Q \times \Sigma \rightarrow Q$$

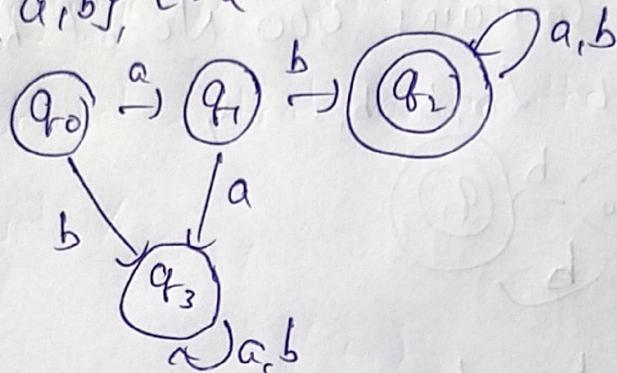
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3. Explain the concept of a DFA's language acceptance. How does the DFA determine whether an input string is accepted or rejected? Provide a detailed explanation of the acceptance process.

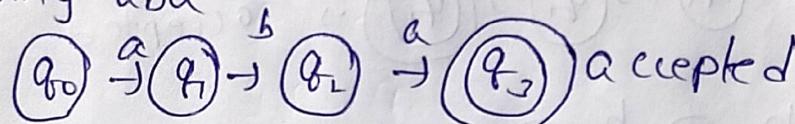
Solution:

Example of DFA Construct DFA for $b^*d^*(w/w \text{ starts with } ab)$

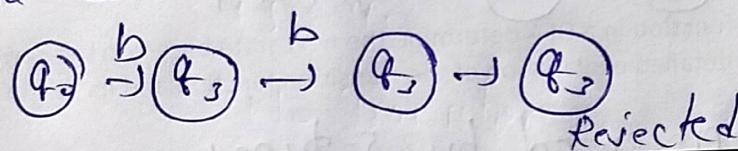
$\Sigma = \{a, b, d\}$, $L = \{aba, abb, abba, \dots\}$



String aba



String Aba



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