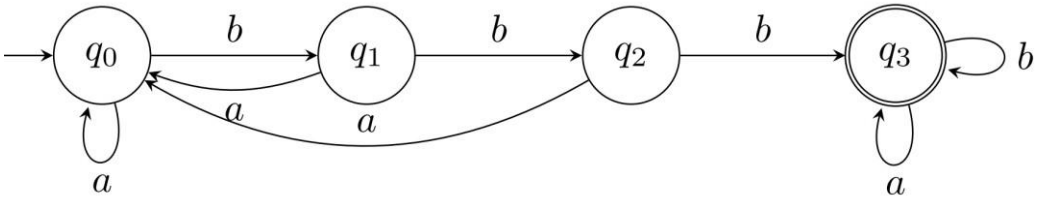
Exercise #1

COSC 3106: Deterministic Finite Automaton

Problem 1: What language is recognized by the following DFA over the alphabet $\{a, b\}$? Provide justification for your answer.



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2.1 Star must include (ε)

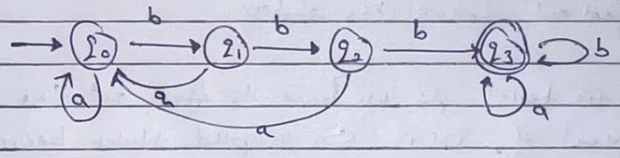
A = {0, 1, 01, 11}

A* = {0, 01, 011, 0101, ε} // Must include Expression (ε)}

Exam How to convert NFA to DFA .....

Cosc 3106 : Deterministic finite Automaton

Q1 what language is recognised by the following DFA over the alphabet {a, b} ?



DFA M: {Q, Σ, δ, q0, F}

Q = {q0, q1, q2, q3}

Σ = {a, b}

δ = {Q × F}

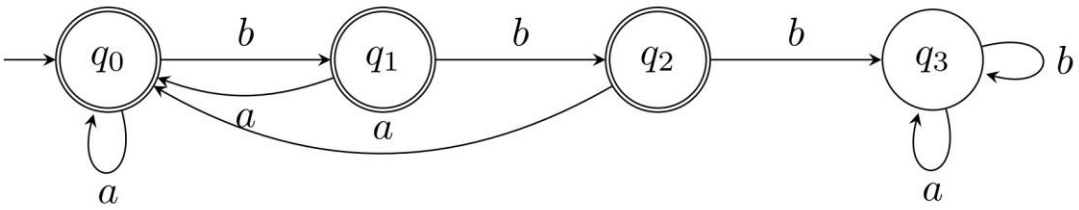
q0 = q0

F = q3

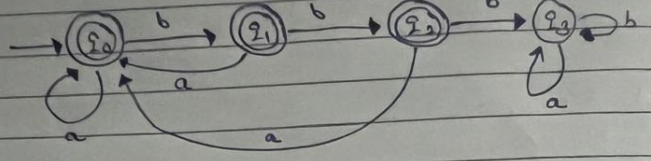
Transition State:

δ	a	b
q0	q0	q1
q1	q0	q2
q2	q0	q3
q3	q3	q3

Problem 2: Construct a new DFA that accepts its complement? Then, verify your answer.


q_0
q_1
q_2
q_3
b
b
b
b
a
a
a
a

Problem 2 Construct a new DFA that accept its complement ? then verify your ans.



for Deterministic Automaton

$M: \{Q, \Sigma, \delta, q_0, f\}$

$Q = \{q_0, q_1, q_2 q_3\}$

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

$q_0 = q_0$

$f = \{q_0, q_1, \{q_2\}$ final accepted states

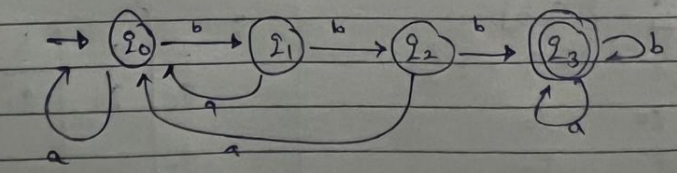
δ

	a	b
q_0	q_0	q_1
q_1	q_0	q_2
q_2	q_0	q_3
q_3	q_3	q_3

lets find out transition states.

Here is the twist As we have to find out the complement of DFA so accepted states become rejected and vice -versa

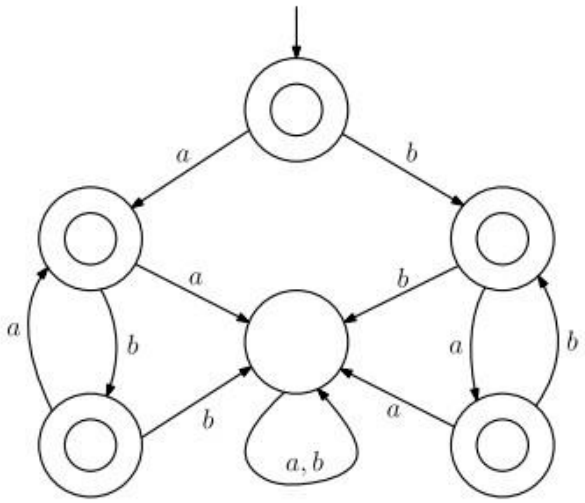
Now



Accepted state ; q_3

Non - accept state ; q_0, q_1, q_2

Problem 3: Define the language of the following DFA?



Let us define the non-accept state as q. The following three claims follow from the state
diagram.

• If we reach the state q, then we will stay there forever.
• If we are in any accept state: If we read aa or bb, then we will reach state q.
• The only way to reach state q is by reading aa or bb.

This means that a string will be rejected if and only if it contains either the substring aa or
bb. Therefore, the DFA accepts exactly the complement of those strings. In other words, it
accepts all strings in which a's and b's strictly alternate. the DFA accepts:

• The empty string ε,
• a single letter (a or b),
• any alternating sequence of the form $(ab)k$ for $k \geq 1$,
• alternating sequences ending in a, i.e. $(ab)ka$ for $k \geq 1$,
• alternating sequences of the form $(ba)k$ for $k \geq 1$.
• alternating sequences ending in b, i.e. $(ba)kb$ for $k \geq 1$,