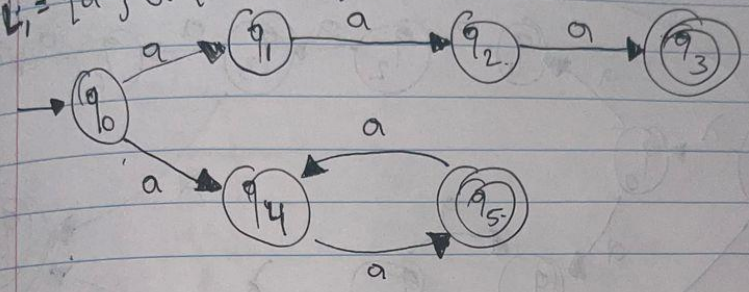
February 26th 2024
Detroit-Michigan

Assignment III: NFA, equivalance & reduction of finite acceptors

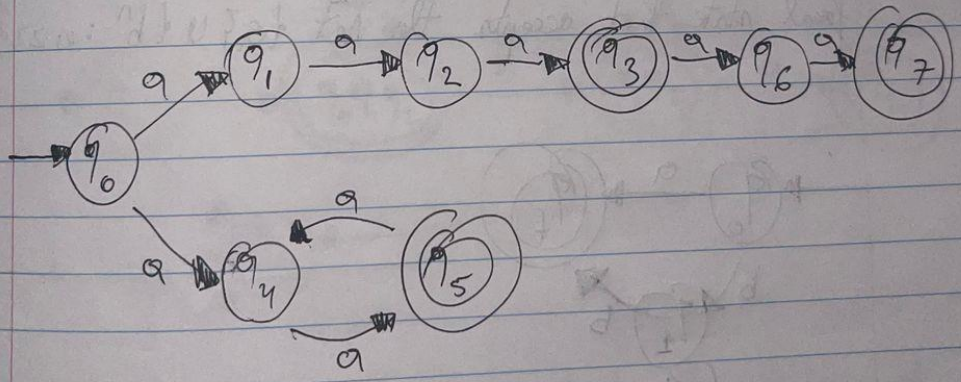
I. let L_1 be the language accepted by nfa below.

$L_1 = \{a^3\} \cup \{a^{2n} : n \geq 1\}$



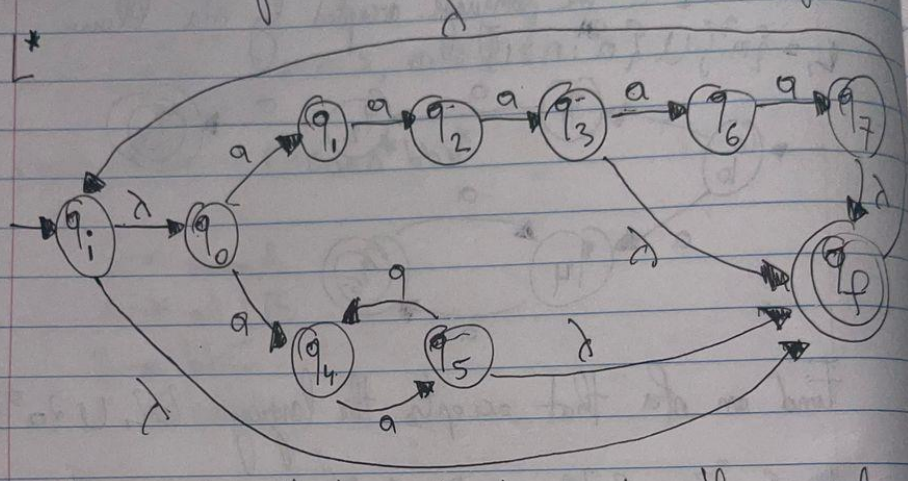
Find an nfa that accepts the language $L = L_1 \cup \{a^5\}$

$L = \{a^3\} \cup \{a^{2n} : n \geq 1\} \cup \{a^5\}$

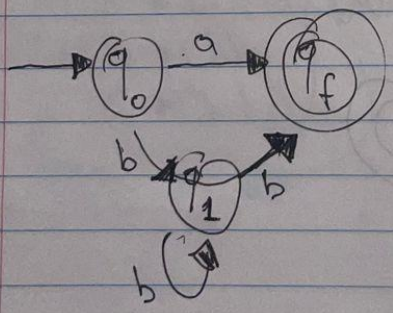


II Find an nfa for L^* where L is the language from prob

L^*



III. Find an nfa without λ-transitions and with a single final state that accepts the set $\{a\} \cup \{b^n : n \geq 2\}$



Hom #1

IV Convert the nfa defined by with initial state q_0 & final state q_2 into equivalent dfa.

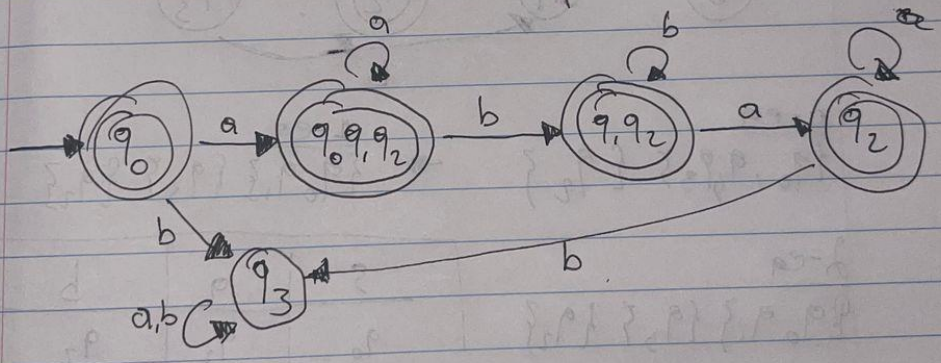
$\delta(q_0, a) = \{q_0, q_1\}$
$\delta(q_1, b) = \{q_1, q_2\}$
$\delta(q_2, a) = \{q_2\}$
$\delta(q_0, \lambda) = \{q_2\}$

nfa

	a	b
q_0	$\{q_0, q_1\}$	ϕ
q_1	ϕ	$\{q_1, q_2\}$
q_2	$\{q_2\}$	ϕ

dfa

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

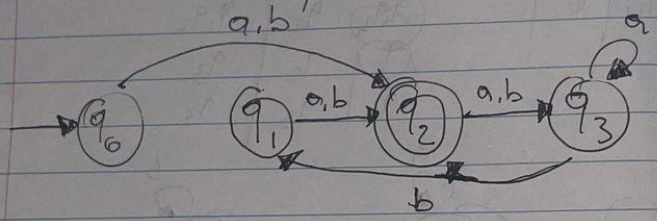


lambda - The reason I stated q_0 as final state. because of λ transition that is pointing to q_2 which is the final state. Because of the free flow then if you are at q_0 you are also at q_2 resulting in a final state. If you are coming from a state transition that has λ, you are going to be in the same state!

I Consider the dfa with initial state q_0, final state q_2

$\delta(q_0,a) = q_2$ $\quad \delta(q_0,b) = q_2$
$\delta(q_1,a) = q_2$ $\quad \delta(q_1,b) = q_2$
$\delta(q_2,a) = q_3$ $\quad \delta(q_2,b) = q_3$
$\delta(q_3,a) = q_3$ $\quad \delta(q_3,b) = q_1$

Find a minimal equivalent dfa



0-eq
$\{q_0, q_1, q_3\}\ \{q_2\}$ → 1-eq $\{q_0 q_1\}\ \{q_3\}\ \{q_2\}$

2-eq
$\{q_0 q_1\}\ \{q_3\}\ \{q_2\}$

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