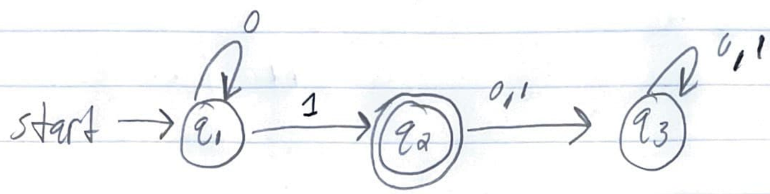
Kush Patel

HW 2

1.) For the DFA state diagram below for alphabet $\Sigma = \{0,1\}$:



a.) Give a formal definition of the language L_0 that it recognizes

$L_0 = \{ w \mid w$ string ends at 1 and there is only one 1 $\}$

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

b.)

String	$\in L_0$	$\notin L_0$
ε		✓
1	✓	
0		✓
00		✓
10		✓
11		✓
100		✓
001	✓	
1011		✓
10001		✓
00001	✓	
00100		✓

1, 001, and 00001 are $\in L_0$ because it fulfills the formal def. of L_0. These 3 strings have only one 1 and ends in 1.

c.) Give the 5-tuple for this DFA

$L_0 = (Q, \Sigma, \delta, q_1, F)$

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

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

q_1 is the start state

$F = \{0, 1\}$

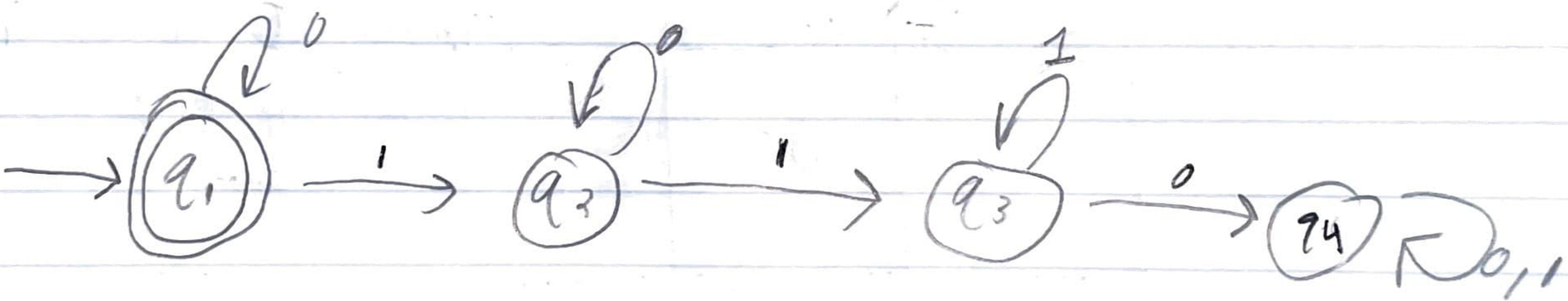
$\delta =$

	0	1
q_1	q_1	q_2
q_2	q_3	q_3
q_3	q_3	q_3

2.) Give a stat diagram of a DFA that recognizes the language:

$L = \{w \mid w$ does not contain the substring $110\}$

The alphabet is $\Sigma = \{0, 1\}$

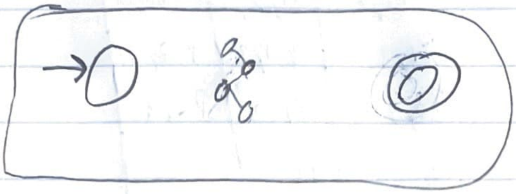


3.1 With the alphabet $\Sigma = \{0,1\}$, using the construction in the proof of Theorem 1.47 give the state diagram of an NFA that recognizes the concatenation of the two languages:

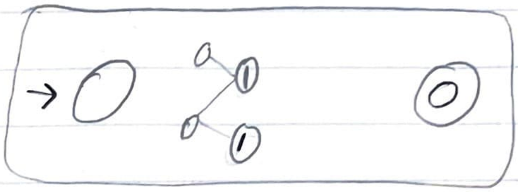
$L_1 = \{w \mid \text{the length of } w \text{ is at most } 5\}$

$L_2 = \{w \mid \text{every odd position of } w \text{ contains a } 1\}$

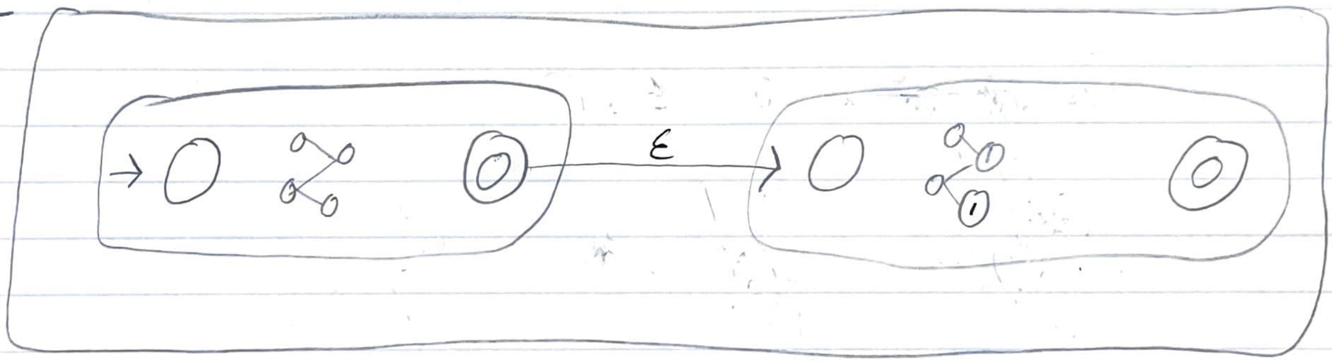
L_1



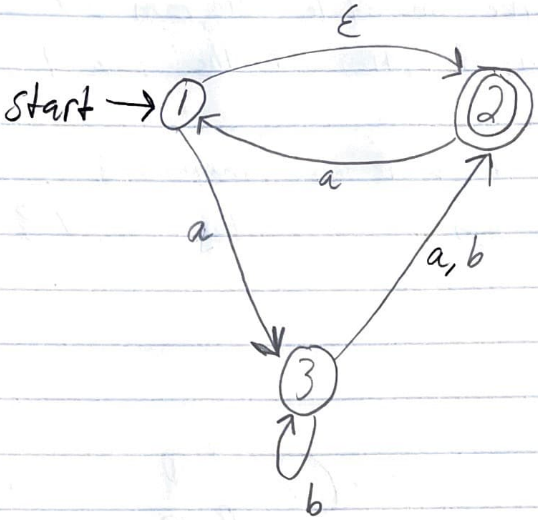
L_2



L



4.) Convert the following NFA to a DFA.



State	a	b
$Q_\emptyset$	$Q_\emptyset$	$Q_\emptyset$
Q_1	Q_3	$Q_\emptyset$
Q_2	$Q_{1,2}$	$Q_\emptyset$
Q_3	Q_2	$Q_{2,3}$
$Q_{1,2}$	$Q_{1,2,3}$	$Q_\emptyset$
$Q_{1,3}$	$Q_{2,3}$	$Q_{2,3}$
$Q_{2,3}$	$Q_{1,2}$	$Q_{2,3}$
$Q_{1,2,3}$	$Q_{1,2,3}$	$Q_{2,3}$

DFA