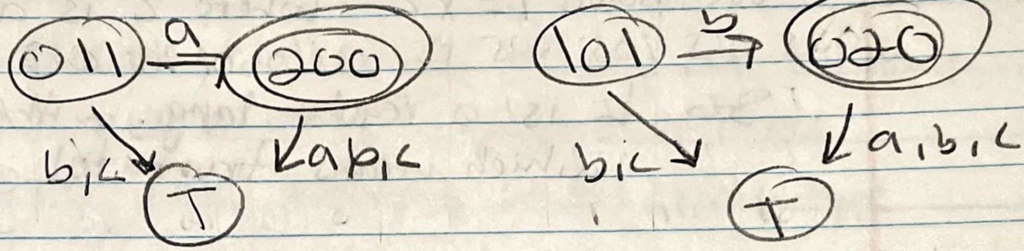
HW 2 Akash Vasisht

1a) The alphabet is (a, b, c).

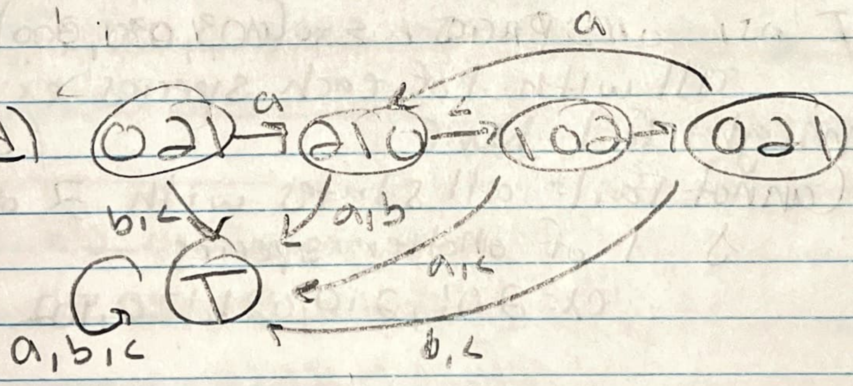
1b)

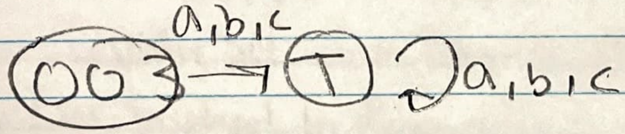
	000	001	002	010	011	012	020	021	022	100	101	102	110
a	000	000	000	000	000	000	000	000	000	000	000	000	T
b	001	010	002	001	010	002	001	010	002	001	010	002	T
c	010	020	001	010	020	001	010	020	001	010	020	001	T

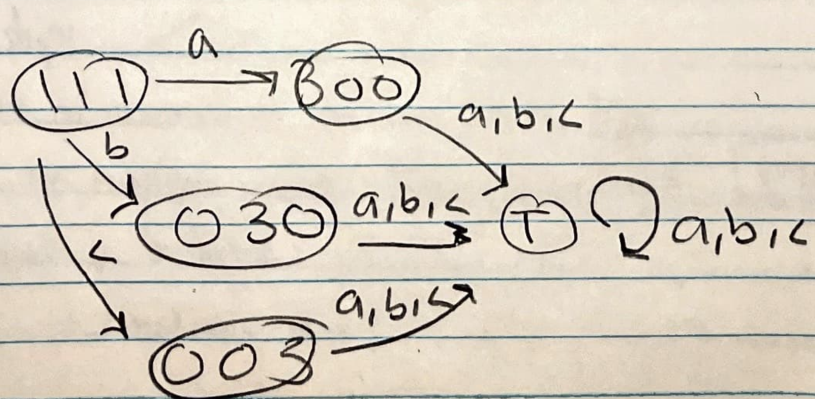
1c)



1d)







e) must fail: all states with 3 of the same species. Ex: (003, 030, 300)

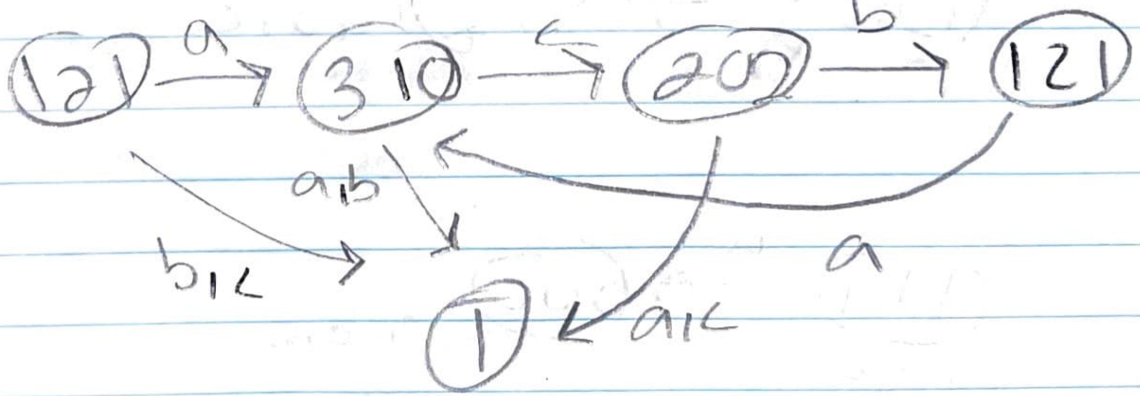
all with 1 of each species ex: (111)

might fail: None

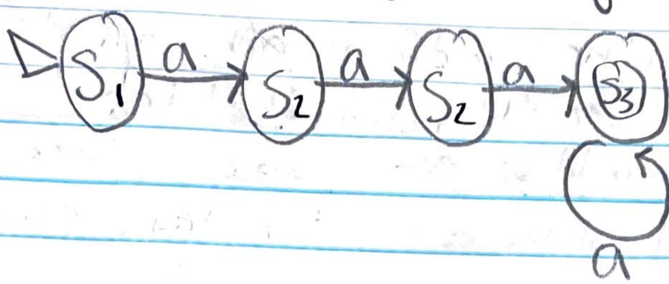
Cannot fail: all states with 2 of one species & 1 of another species

ex: 201, 210, 021, 120, 102

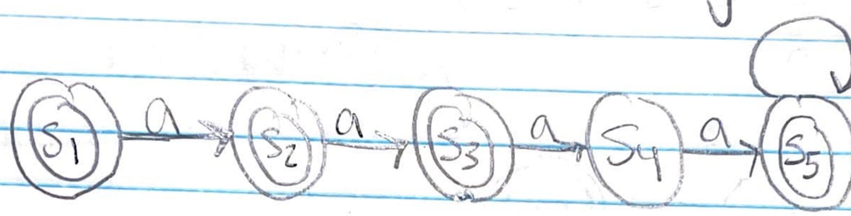
f)



2) If we can express a lang. as DFA then it is a regular lang., since we can with this it is regular.



3) Same as above, bottom drawing shows its regular.

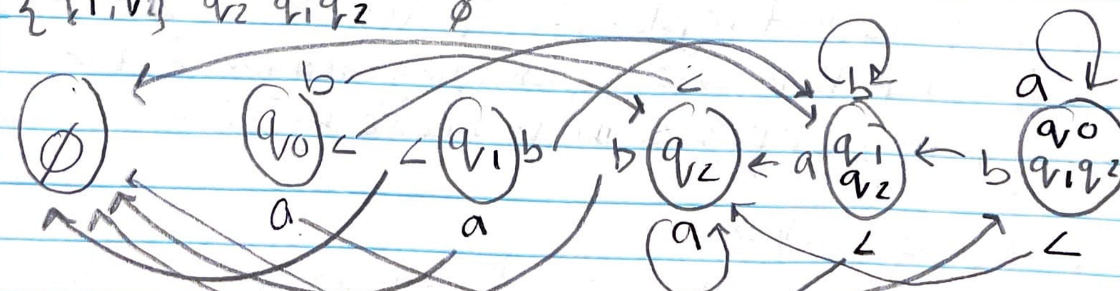


4)

	a	b	<	λ
q_0	q_0, q_1	–	–	q_2
q_1	–	q_1, q_2	–	–
q_2	q_2	–	–	–

DFA Matrix

	$a\lambda^*$	$b\lambda^*$	$<\lambda^*$
q_0	$\{q_0, q_1, q_2\}$	q_2	q_2
q_1	$\emptyset$	$\{q_1, q_2\}$	$\emptyset$
q_2	q_2	$\emptyset$	$\emptyset$
$\{q_0, q_1, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$	q_2
$\{q_1, q_2\}$	q_2	q_1, q_2	$\emptyset$



5) Compliment of $L(M)$ for first equation =

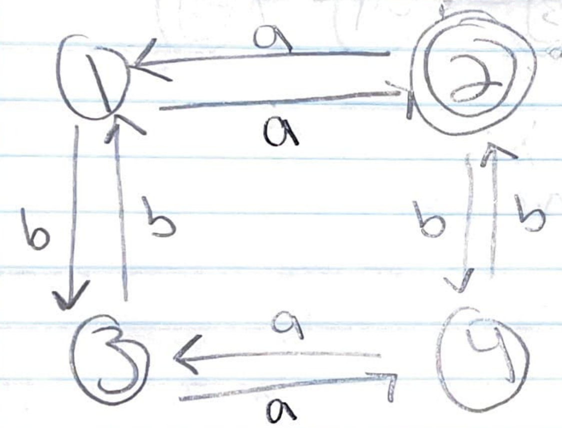
for second equation $\geq$

Since we compliment a dfa on nfa all the final states become non final states, new would be $Q-F$, so compliment of $L(M)$ should be equal to second equation

$\neq$

$L = [a] \quad \delta^*[q_0, a] \cap (Q-F) = [z_i] \neq 0$

6)



7) $M \rightarrow$ DFA for L

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

L is not regular, pump lemma

then there exists pumping length p for any string s in truncate L of length p

$S = xyz$

$|y| > 0 \; |xy| \leq P \; xy^k z$ = truncate for $k \geq 0$

Let S be any string of L with atleast $P+1$

truncate $= s'x$ $\quad s'x = P+1 \quad |s'| < P$

By pumping $s'x = xyz \quad |y| > 0 \quad |xy| \leq P$

Since $S'x$ is in L and L doesn't contain λ
we have $Y = xz'$ where z' is a non-empty string

So L is a regular lang. without empty string,
which means truncateL is regular.