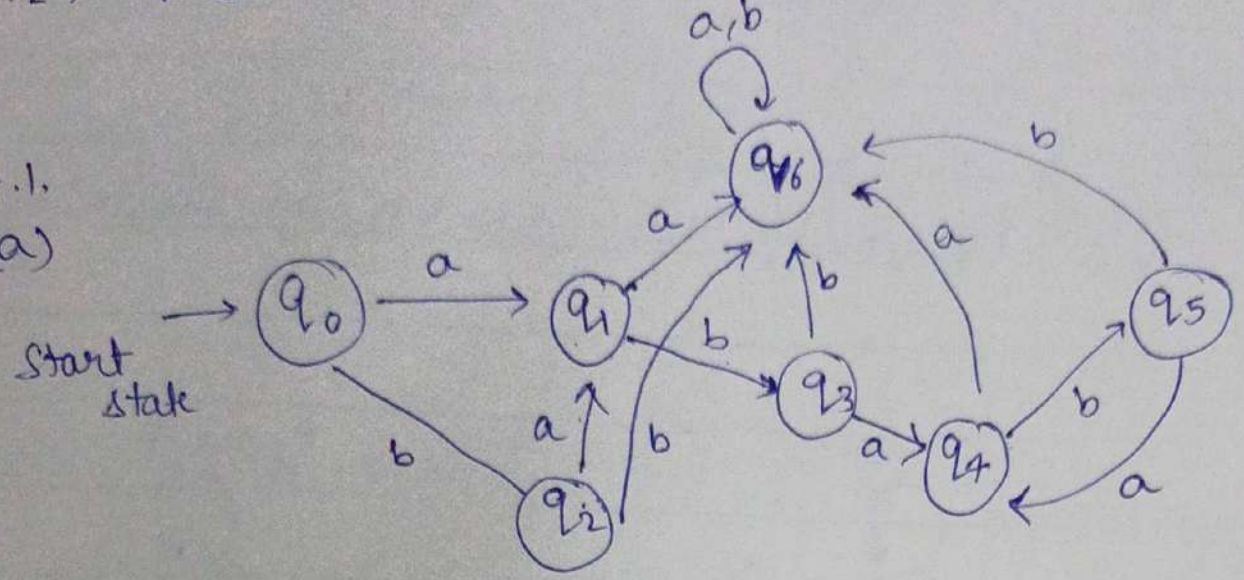
~~.2. We~~

1.1.

(a)



q_1 = state with single 'a' & end with 'a'.

q_2 = state with single 'b' & no 'a'.

q_3 = state with single 'a' & end with 'b'.

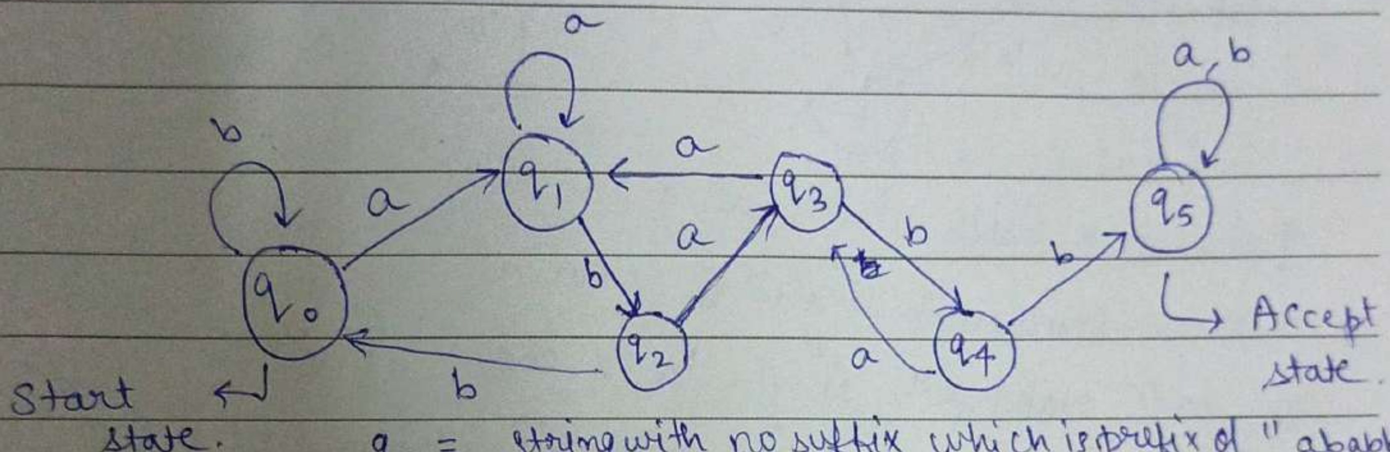
q_4 = state with atleast 2 a's & ending at a.

q_5 = state with atleast 2 a's & ending at b.

q_6 = dump state.

Q.1.

(b). $B = \{x \in \{a,b\}^* \mid x$ has ababb as substring

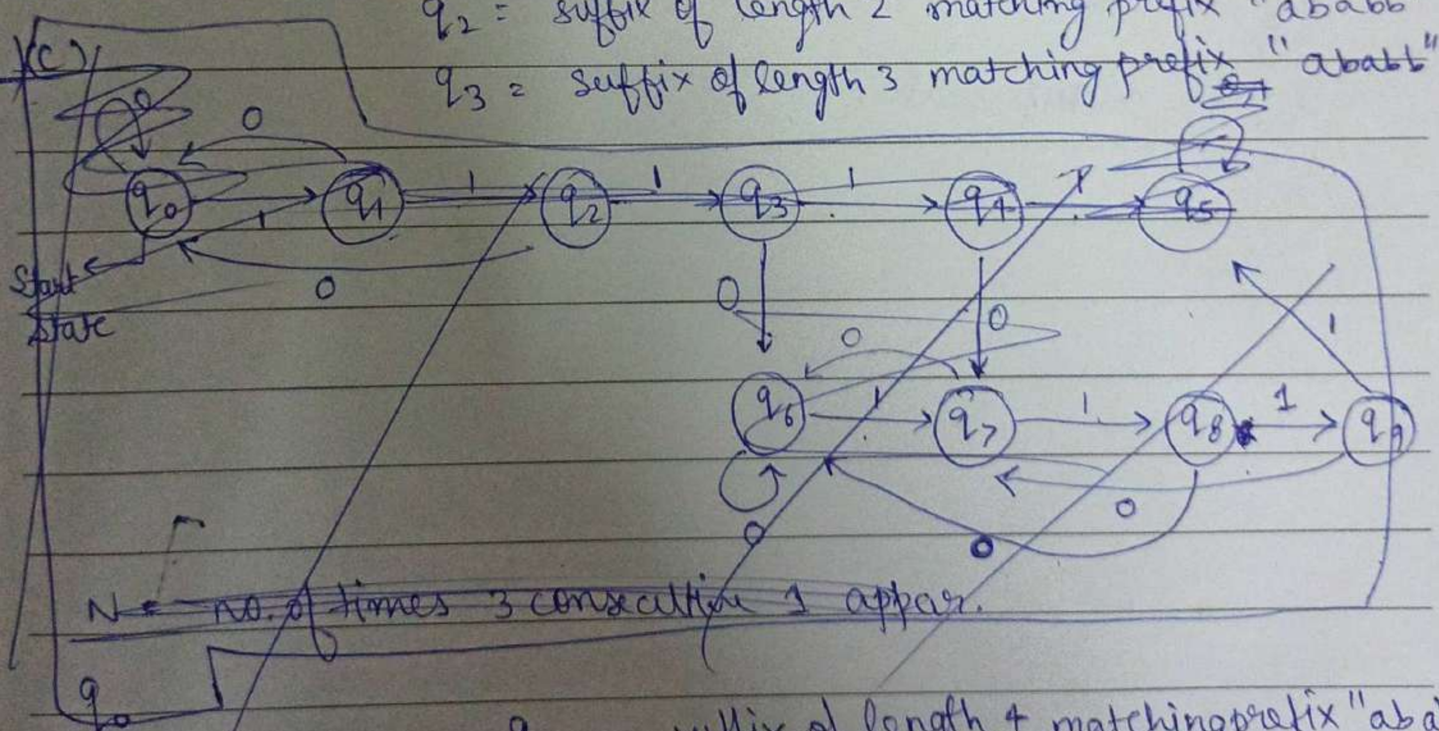


q_0 = string with no suffix which is prefix of "ababb".

q_1 = suffix of length 1 matching the prefix "ababb"

q_2 = suffix of length 2 matching prefix "ababb"

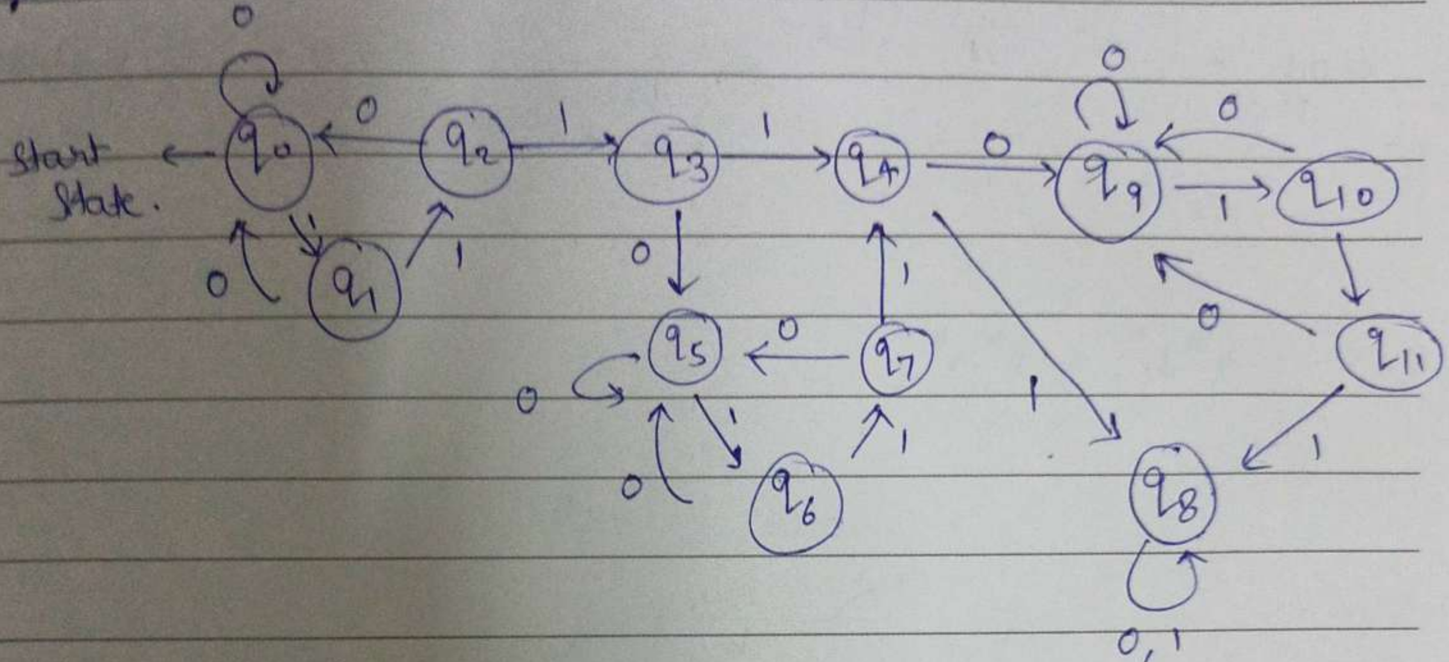
q_3 = suffix of length 3 matching prefix "ababb"



q_4 = suffix of length 4 matching prefix "ababb"

q_5 = dump state

Q.1.c



N = no. of times 3 consecutive 1 appears.

q_0 ≡ N=0 & w not end with 1.

q_1 ≡ N=0 & w end with 1

q_2 ≡ N=0 & w end with 11

q_3 ≡ N=1 & w end with 111

q_4 ≡ N=2 & w end with 111

q_5 ≡ N=1 & w end with 0

q_6 ≡ N=1 & w end with 1

q_7 ≡ N=1 & w end with 11

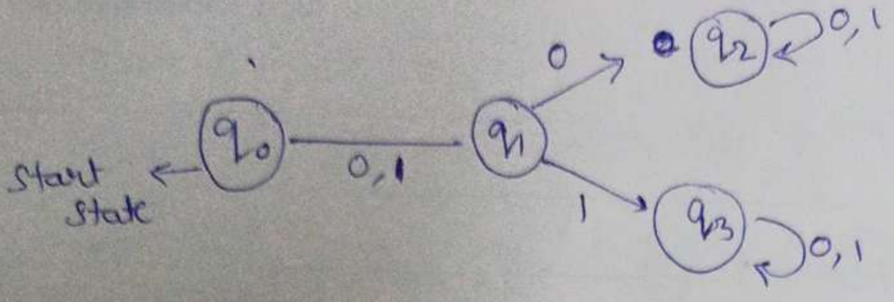
q_8 ≡ N≥3 (dump state)

q_9 ≡ N=2 & w end with 0

q_{10} ≡ N=2 & w end with 01

q_{11} ≡ N=2 & w end with 011

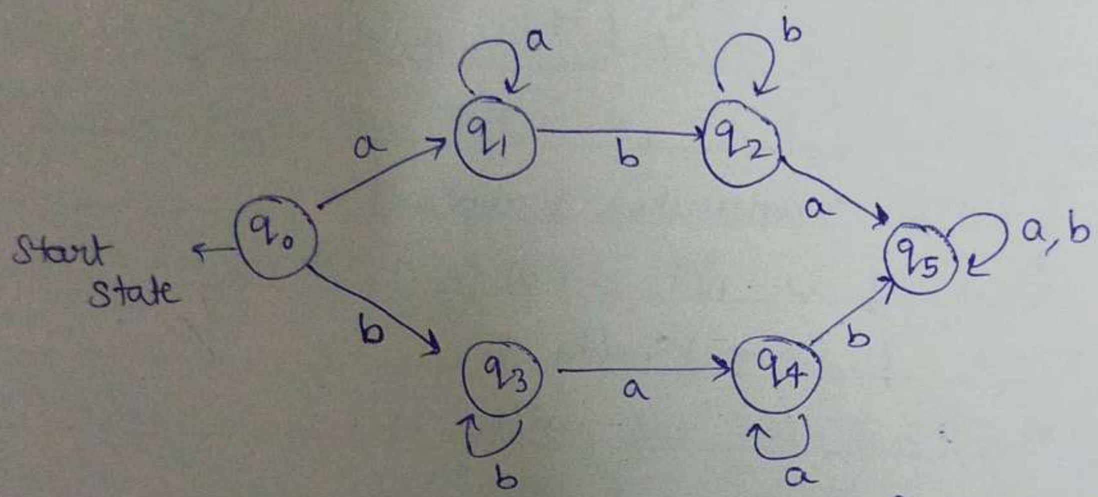
Q.2. (a) $\epsilon + (0+1)\,0\,(0+1)^*$



q_2 = accept state.

q_0 = start state

(b) $a^* b^* + b^* a^*$



q_1, q_2, q_3, q_4 = accept state

q_0 = start state.

A.3. $L = \{ a.b \in \Sigma^* \mid a \in A \ \& \ b \in B \}$

$f(A,B) = \{ W \in \Sigma^* \mid W = l_1 l_2 \ldots l_k \text{ where } L_i \in L \}$

$f(A,B) = L\,L\,L\,L \ldots L \rightarrow$ k times.

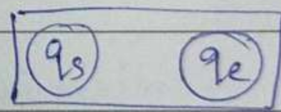
Given - A, B regular.

As $L = A.B.$ $\Rightarrow$ L is regular.

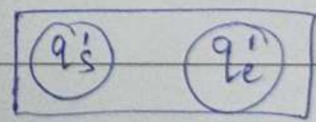
$\Rightarrow$ $f(A,B)$ is also regular.

($\because$ Concatanation of 2 regular language is regular gives regular language).

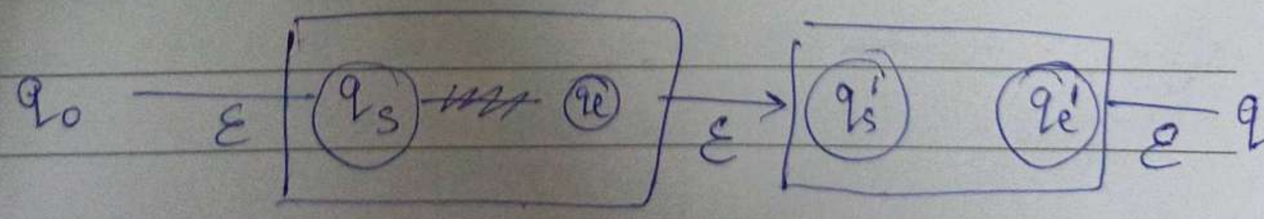
Proof: let A's NFA be



B's NFA be



So A.B ~~can be~~ NFA....



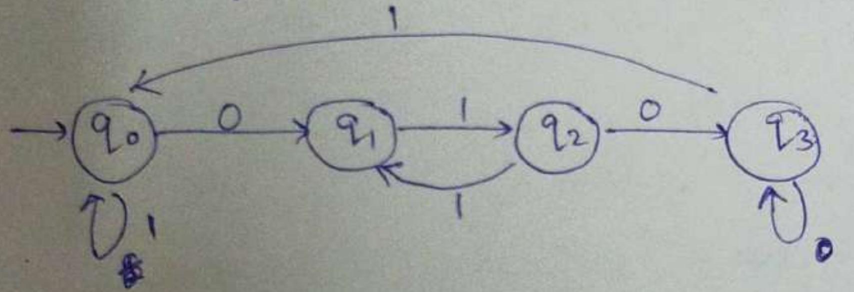
$\Rightarrow$ A.B is regular.

A.4. To minimise a DFA we can use the following.

1. Creat a table of pairs $\{P, q\}$. All entries of table are unmarked.
2. Mark pair $\{P, q\}$. if $p \in F$ & $q \notin F$. or vice versa.
3. Repeat the following until no more pairs can be marked
   - Mark $\{p, q\}$ if $\{\delta(p, a), \delta(q, a)\}$ is marked for some $a \in \Sigma$.
4. Two states p & q are equivalent if they are not marked.

So we will check the reachability of all states.
Its clear that the states q_4, q_5, q_6, q_7 are not reachable

So we can remove them from DFA.



— Fig.(X)

Now to minimise DFA do the steps given above.

0			
	1		
		2	
X	X	X	3

$\longrightarrow$

0			
	1		
X		2	
X	X	X	3

~~After 1st iteration of step 3.~~

0			
	1		
X	X	2	
X	X	X	3

~~After 2 iterations of step 3.~~

0			
X	1		
X	X	2	
X	X	X	3

From this table its clear that no 2 states have an equivalence relation an so the final DFA is the original one. (Fig(X))