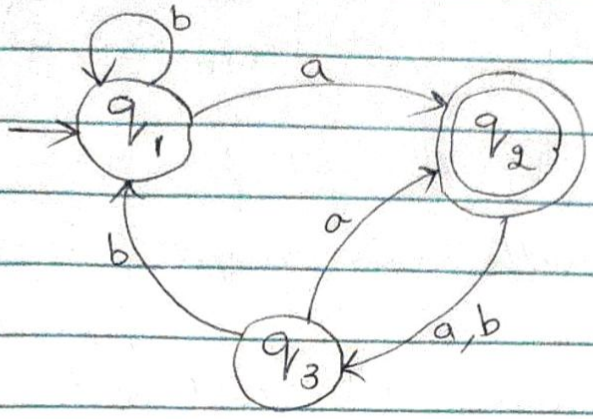
Theory of Automata

Homework - 2

1)

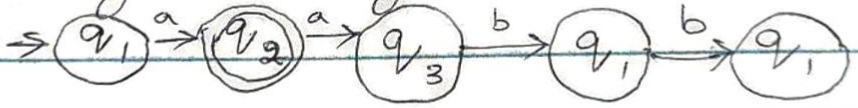


M_1

a) The start state for the M_1 DFA is q_1

b) The set of accept states for M_1 is $\{q_2\}$

c) On giving the input "aabb", the machine goes through following states



d) The machine accepts the string w if

$(q_0, w) \vdash^*_{M_1} (q, e)$ for some $q \in F$

Here $F = \{q_2\}$

So $(q_0, aabb) \vdash_{M_1} (q_2, abb)$

$\vdash_{M_1} (q_3, bb)$

$\vdash_{M_1} (q_1, b)$

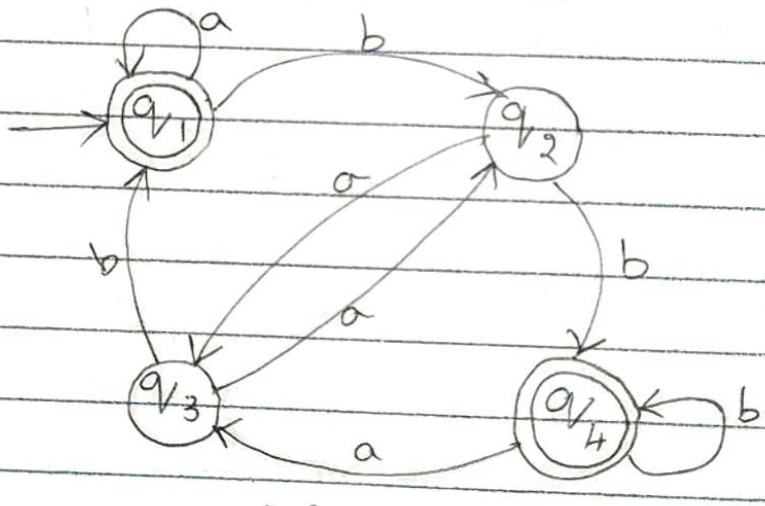
$\vdash_{M_1} (q_1, e)$

$\Rightarrow (q_1, aabb) \vdash_{M_1}^{*} (q_1, e)$

$q_1 \notin \{q_2\}$

M_1 will not accept the string "aabb"

e) The machine M_1 will not accept string ε as DFA doesnot accept ε.

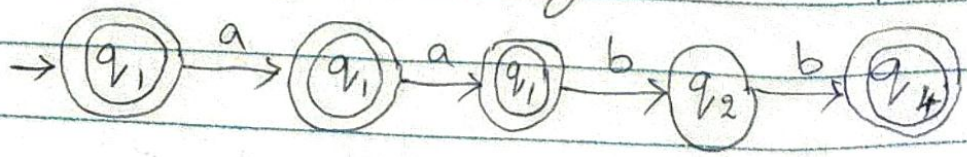


M_2

a) Start state q_1

b) Set of accept states for M_2 is $\{q_1, q_4\}$

c) M_2 goes through following states for input "aabb"



d) $(q_1, aabb) \vdash_{M_2} (q_1, abb)$

$\vdash_{M_2} (q_1, bb)$

$\vdash_{M_2} (q_2, b)$

$\vdash_{M_2} (q_4, e)$

$\Rightarrow (q_1, aabb) \vdash^*_{M_2} (q_4, e)$

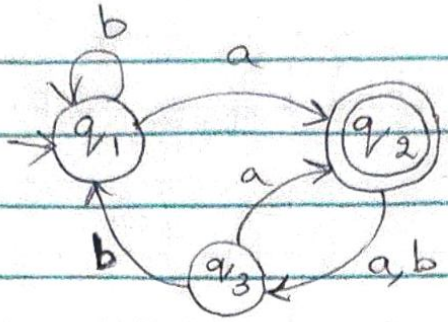
$q_4 \in \{q_1, q_4\}$ set of final states.

M_2 will accept the string "aabb"

e) The machine M_2 will not accept the string ε because

- ε move is not allowed in DFA and ε move will change it from DFA to NFA.

2)



M_1

$M_1 = (\{q_1, q_2, q_3\}, \{a, b\}, \delta, q_1, \{q_2\})$

$Q = \{q_1, q_2, q_3\}$ are set of states

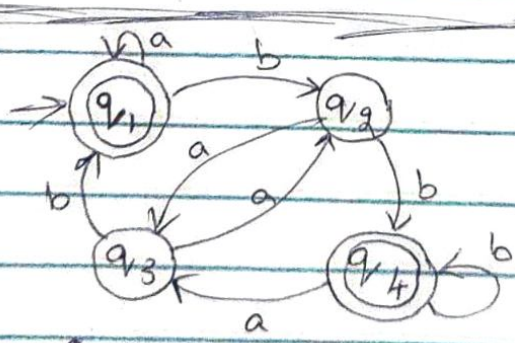
$\Sigma = \{a, b\}$ aare alphabets

$\delta =$

	a	b
q_1	q_2	q_1
q_2	q_3	q_3
q_3	q_2	q_1

q_0 = start state (q_1)

F = set of final states $\{q_2\}$



$= M_2$

$M_2 = (Q, \Sigma, \delta, q_0, F)$

$Q = \{q_1, q_2, q_3, q_4\}$

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

δ =

	a	b
q_1	q_1	q_2
q_2	q_3	q_4
q_3	q_2	q_1
q_4	q_3	q_4

q_0 = start state = q_1

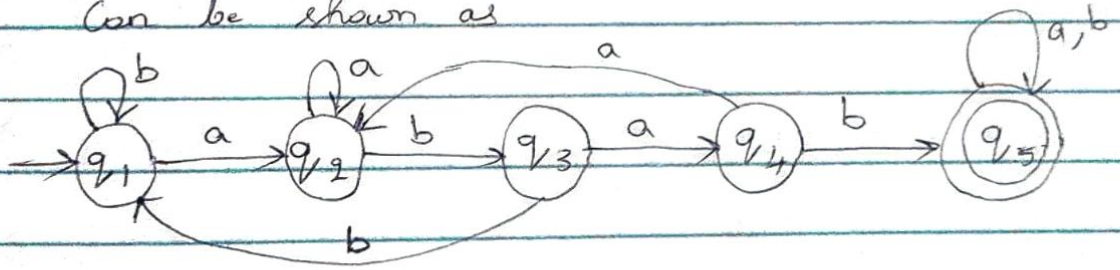
F = set of final states = $\{q_1, q_4\}$

$\Rightarrow M_2 = (\{q_1, q_2, q_3, q_4\}, \{a,b\}, \delta, q_1, \{q_1, q_4\})$

3) DFA for

3.1) $\{w \in \{a,b\}^* : w$ has abab as substring$\}$

Can be shown as



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

$Q = \{q_1, q_2, q_3, q_4, q_5\}$

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

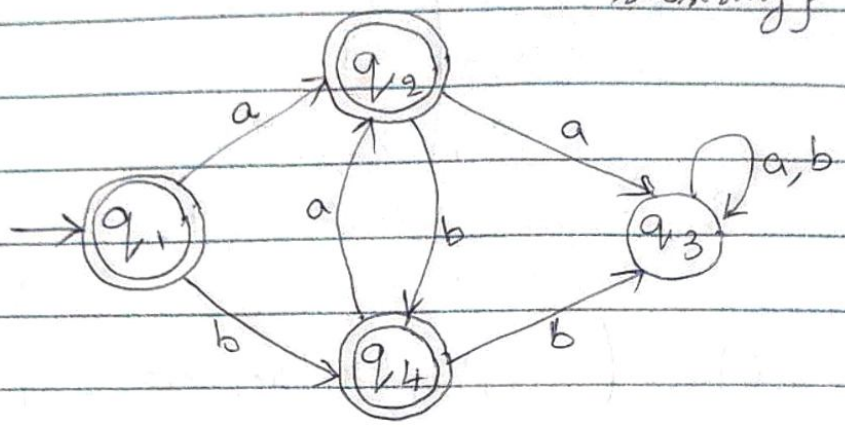
$q_0 = q_1$

$F = \{q_5\}$

δ =

	a	b
q_1	q_2	q_1
q_2	q_2	q_3
q_3	q_4	q_1
q_4	q_2	q_5
q_5	q_5	q_5

3.2) DFA for
$\{w \in \{a,b\}^* : w$ has neither aa or bb as a substring$\}$



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

$Q = \{q_1, q_2, q_3, q_4\}$

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

$q_0 = q_1$

$F = \{q_1, q_2, q_4\}$

$\delta =$

	a	b
q_1	q_2	q_4
q_2	q_3	q_4
q_3	q_3	q_3
q_4	q_2	q_3