

Ex 1

$w \rightarrow \text{length}$   
Minimization of DFA

DATE: / /

PAGE: /

Property we need to minimize

Let  $(p, q)$  are the states

if  $S(p, w) \in F$   
 $\Rightarrow S(q, w) \in F$

if  $S(p, w) \notin F$   
 $\Rightarrow S(q, w) \notin F$

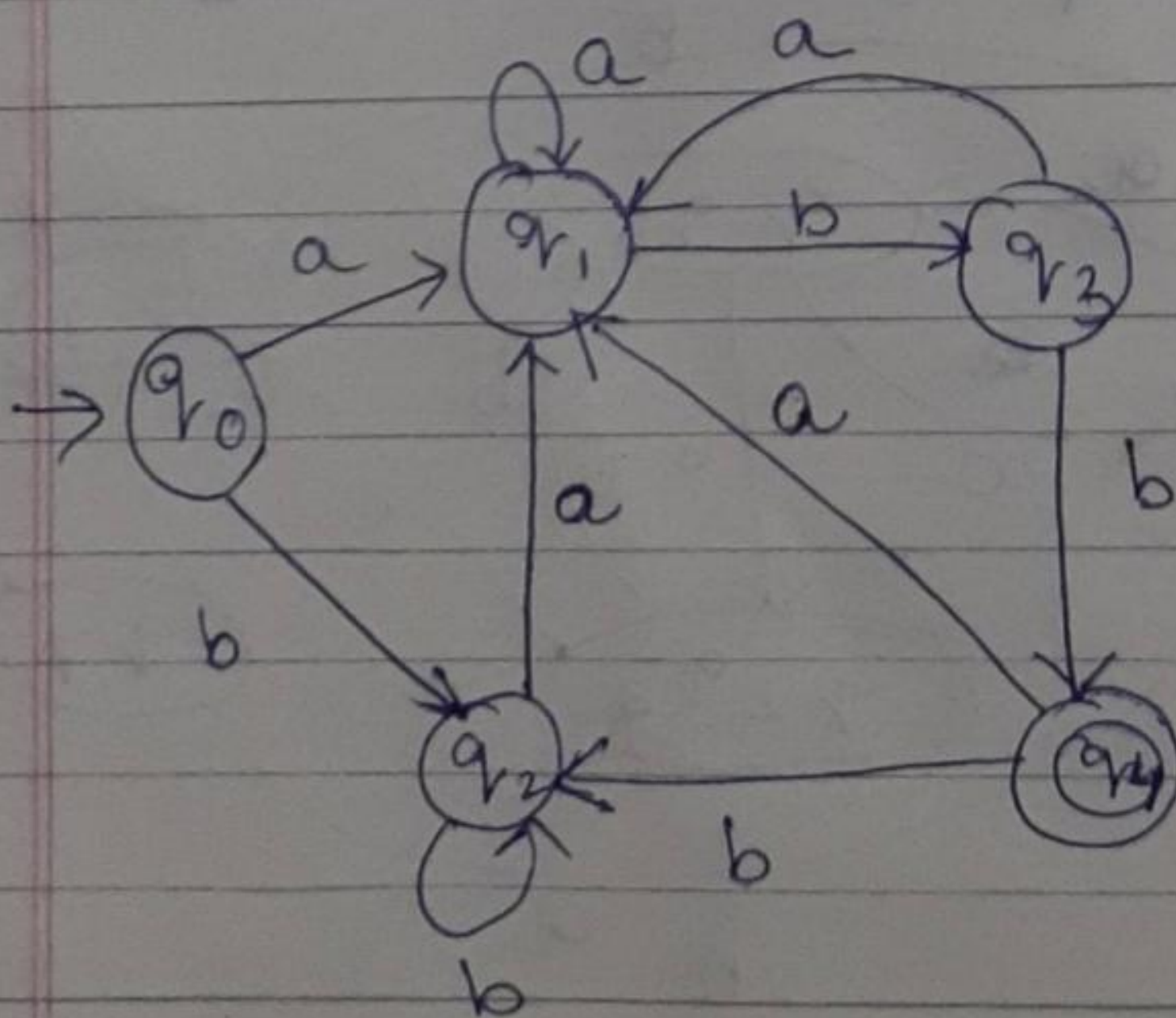
where  $p \neq q$  are equivalent

if  $|w| = 0$ , both the states are equivalent

$|w| = 1$ , " " "

$|w| = 2$ , " " "

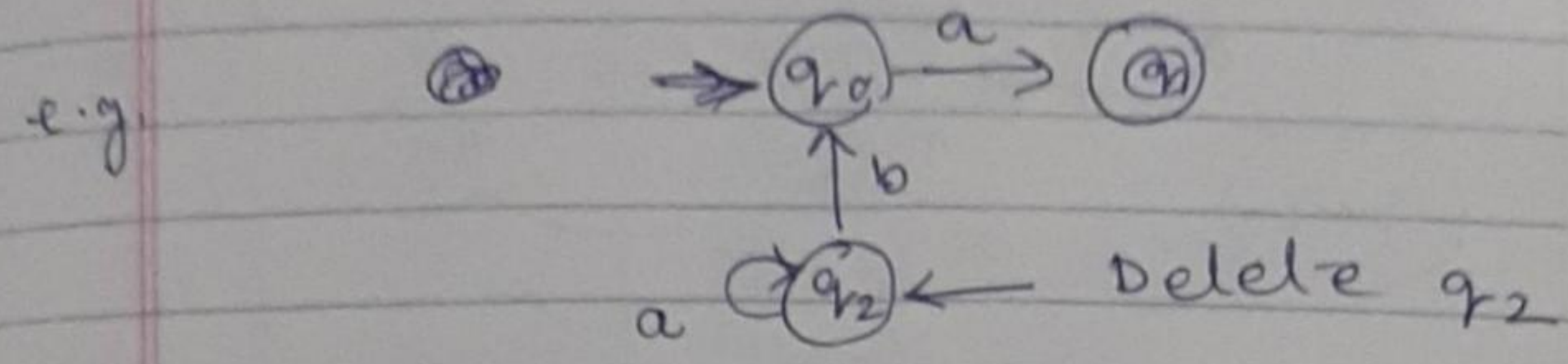
$|w| = n$ , " " "





# Steps to minimize

1. Try to delete all the states to which we can not reach from the initial state.



## State Transition Table

states	a	b
$q_0$	$q_1$	$q_2$
$q_1$	$q_1$	$q_3$
$q_2$	$q_1$	$q_2$
$q_3$	$q_1$	$q_4$
$q_4$	$q_1$	$q_2$

2. Try to find out '0' equivalence state.

separate non final states from final state.

i.e. 0 equi.  $[q_0, q_1, q_2, q_3]$   $[q_4]$

1 "  $[q_0, q_1, q_2]$   $[q_3]$   $[q_4]$

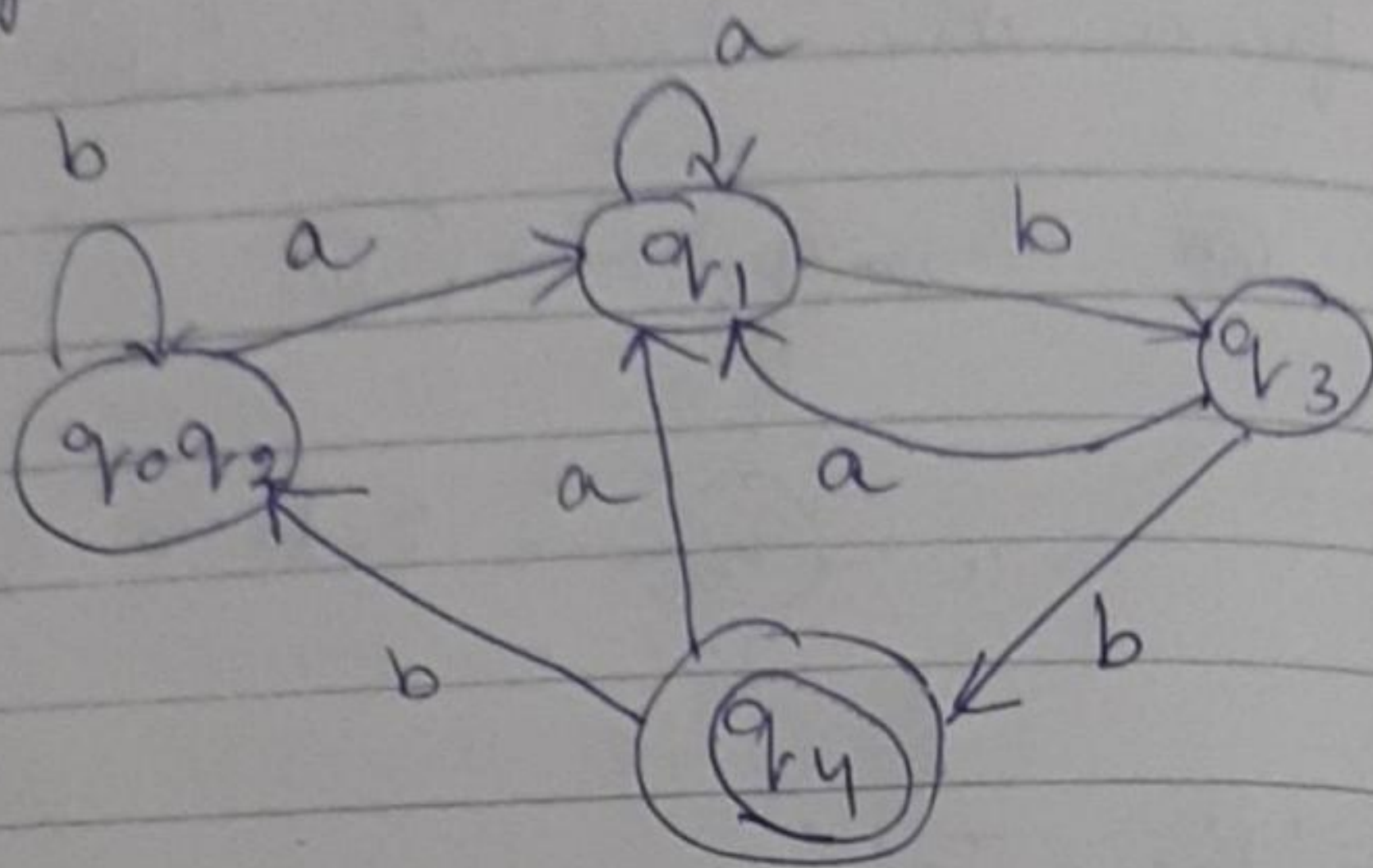
2 "  $[q_0, q_2]$   $[q_1]$   $[q_3]$   $[q_4]$

3 "  $[q_0, q_2]$   $[q_1]$   $[q_3]$   $[q_4]$

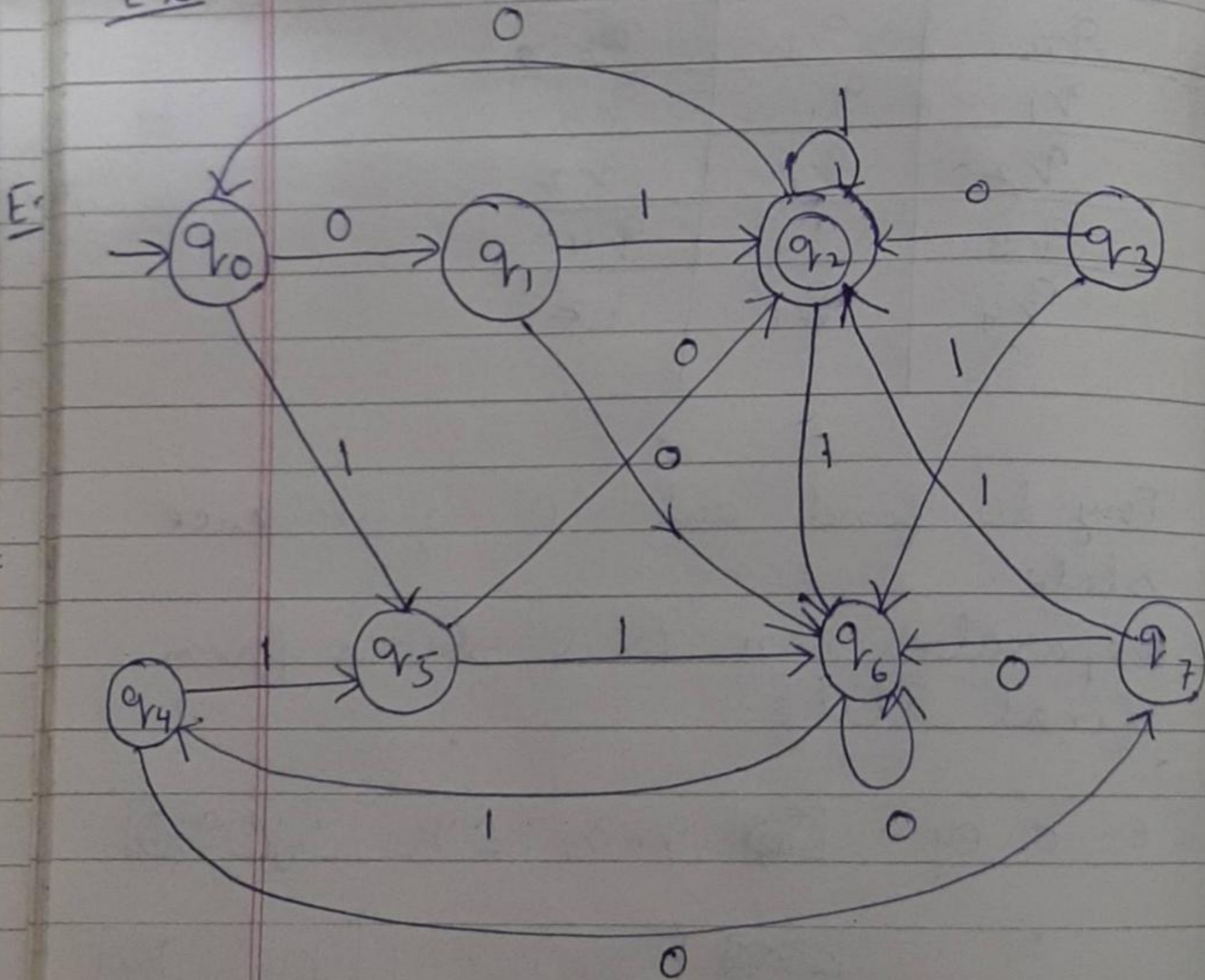
can not be divisible  
cause both are giving same state.



continue upto ~~no more~~  
 2 equivalence states where  
 we get the same result sets.



Ex.





# state Transition table

DATE: / /  
PAGE:

states	0	1
→ q <sub>0</sub>	q <sub>1</sub>	q <sub>5</sub>
q <sub>1</sub>	q <sub>6</sub>	q <sub>2</sub> *
* q <sub>2</sub>	q <sub>0</sub>	q <sub>2</sub>
q <sub>3</sub>	q <sub>2</sub>	q <sub>6</sub> ✗
q <sub>4</sub>	q <sub>7</sub>	q <sub>5</sub>
q <sub>5</sub>	q <sub>2</sub>	q <sub>6</sub>
q <sub>6</sub>	q <sub>6</sub>	q <sub>4</sub>
q <sub>7</sub>	q <sub>6</sub>	q <sub>2</sub>

## states equivalence

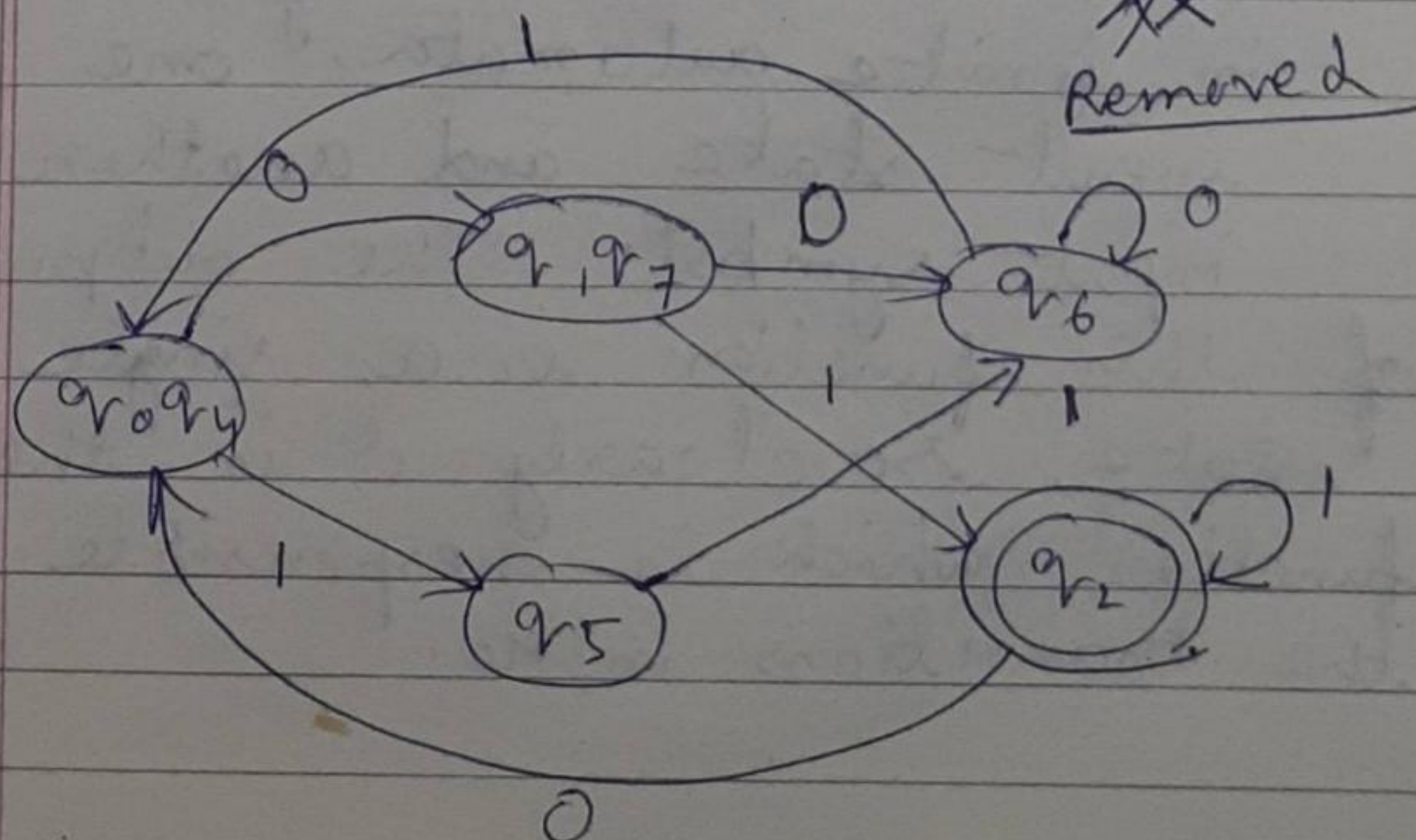
0 equiv. [q<sub>0</sub> q<sub>1</sub> ~~q<sub>3</sub>~~ q<sub>4</sub> q<sub>5</sub> q<sub>6</sub> q<sub>7</sub>] [q<sub>2</sub>]

1 " ~~[q<sub>0</sub> q<sub>1</sub> q<sub>4</sub> q<sub>6</sub> q<sub>7</sub>] [q<sub>3</sub> q<sub>5</sub>] [q<sub>2</sub>]~~

2 " [q<sub>0</sub> q<sub>4</sub> q<sub>6</sub>] [q<sub>1</sub> q<sub>7</sub>] [~~q<sub>3</sub>~~ q<sub>5</sub>] [q<sub>2</sub>]

3 " [q<sub>0</sub> q<sub>4</sub>] [q<sub>6</sub>] [q<sub>1</sub> q<sub>7</sub>] [~~q<sub>3</sub>~~ q<sub>5</sub>] [q<sub>2</sub>]

4 " [q<sub>0</sub> q<sub>4</sub>] [q<sub>1</sub> q<sub>7</sub>] [~~q<sub>3</sub>~~ q<sub>5</sub>] [q<sub>6</sub>] [q<sub>2</sub>]

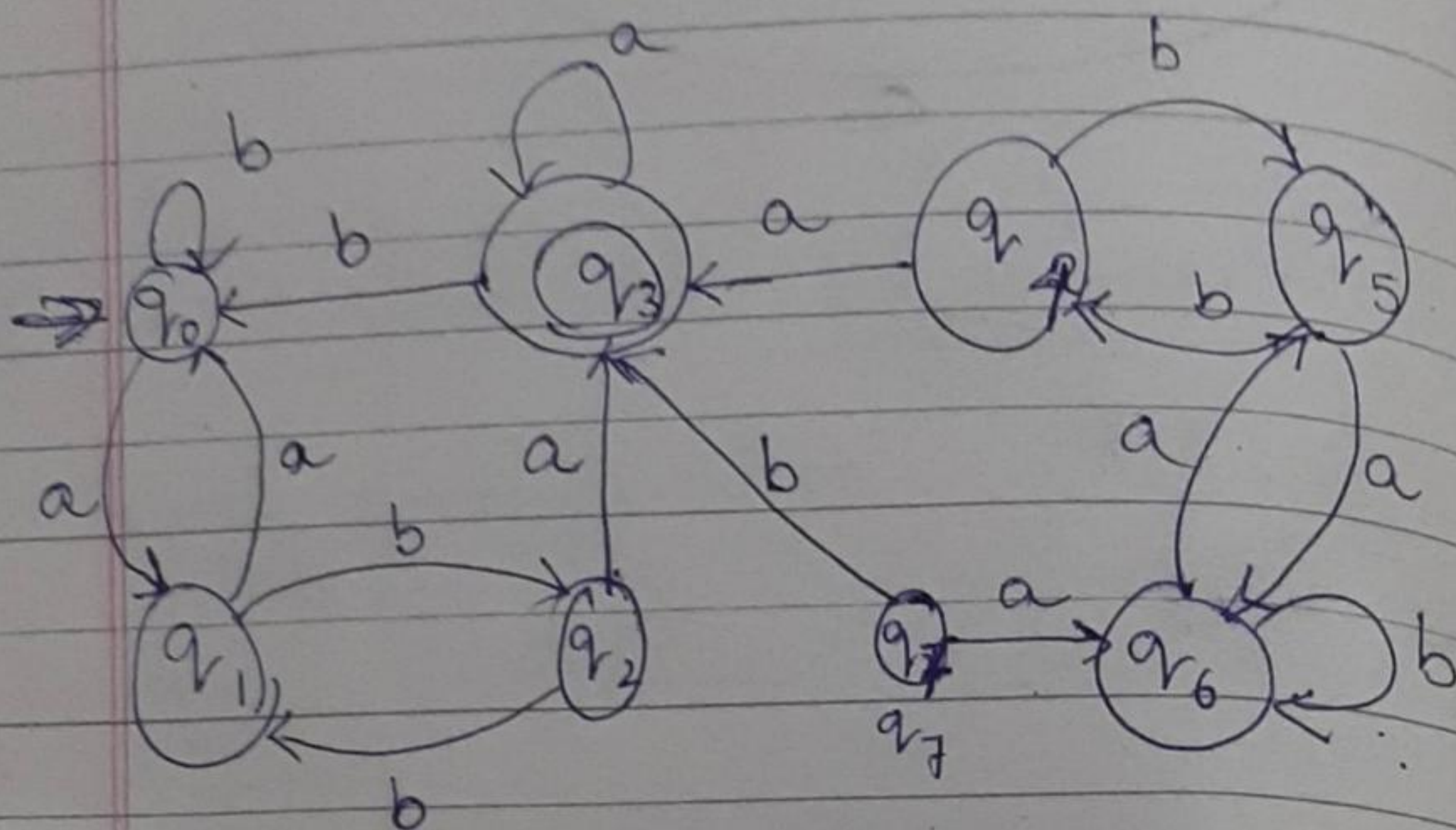
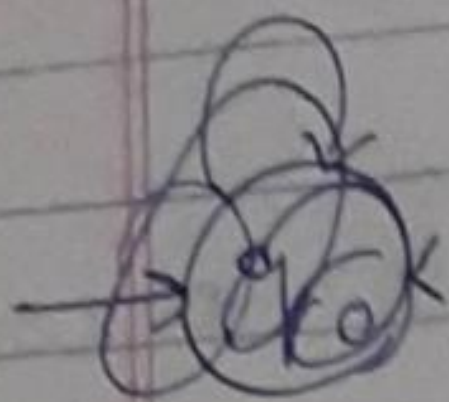




# Minimization of FA

DATE: / /

PAGE: /



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States	Input	
	a	b
→ q <sub>0</sub>	q <sub>1</sub>	q <sub>0</sub>
≡ q <sub>1</sub>	q <sub>0</sub>	q <sub>2</sub>
- q <sub>2</sub>	q <sub>3</sub>	q <sub>1</sub>
- * q <sub>3</sub>	q <sub>3</sub>	q <sub>0</sub>
- q <sub>4</sub>	q <sub>3</sub>	q <sub>5</sub>
≡ q <sub>5</sub>	q <sub>6</sub>	q <sub>4</sub>
q <sub>6</sub>	q <sub>5</sub>	q <sub>6</sub>
= q <sub>7</sub>	q <sub>6</sub>	q <sub>3</sub>



$q_2 \rightarrow q_3$   
 $q_4 \rightarrow q_3$

So we have separated this

DATE:	/	/
PAGE:		

$$\pi_0 = \{ \{q_3\}, \{q_0, q_1, q_2, q_4, q_5, q_6, q_7\} \}$$

For Input a

$$\pi_1 = \{ \{q_3\}, \{q_2, q_4\}, \{q_0, q_1, q_5, q_6, q_7\} \}$$

Input b

$$\pi_2 = \{ \{q_3\}, \{q_2, q_4\}, \{q_7\}, \{q_0, q_1, q_5, q_6\} \}$$

$$\pi_3 = \{ \{q_3\}, \{q_2, q_4\}, \{q_7\}, \{q_1, q_5\}, \{q_0, q_6\} \}$$

$\Downarrow$   
 This can not be broken further.

state	Input = a	Input = b
$\bullet \rightarrow [q_0, q_6]$	$[q_1, q_5]$	$[q_0, q_6]$
$[q_1, q_5]$	$[q_0, q_6]$	$[q_2, q_4]$
$[q_2, q_4]$	$[q_3]$	$[q_1, q_5]$
$* [q_3]$	$[q_3]$	$[q_0, q_6]$
$[q_7]$	$[q_1, q_6]$	$[q_3]$

