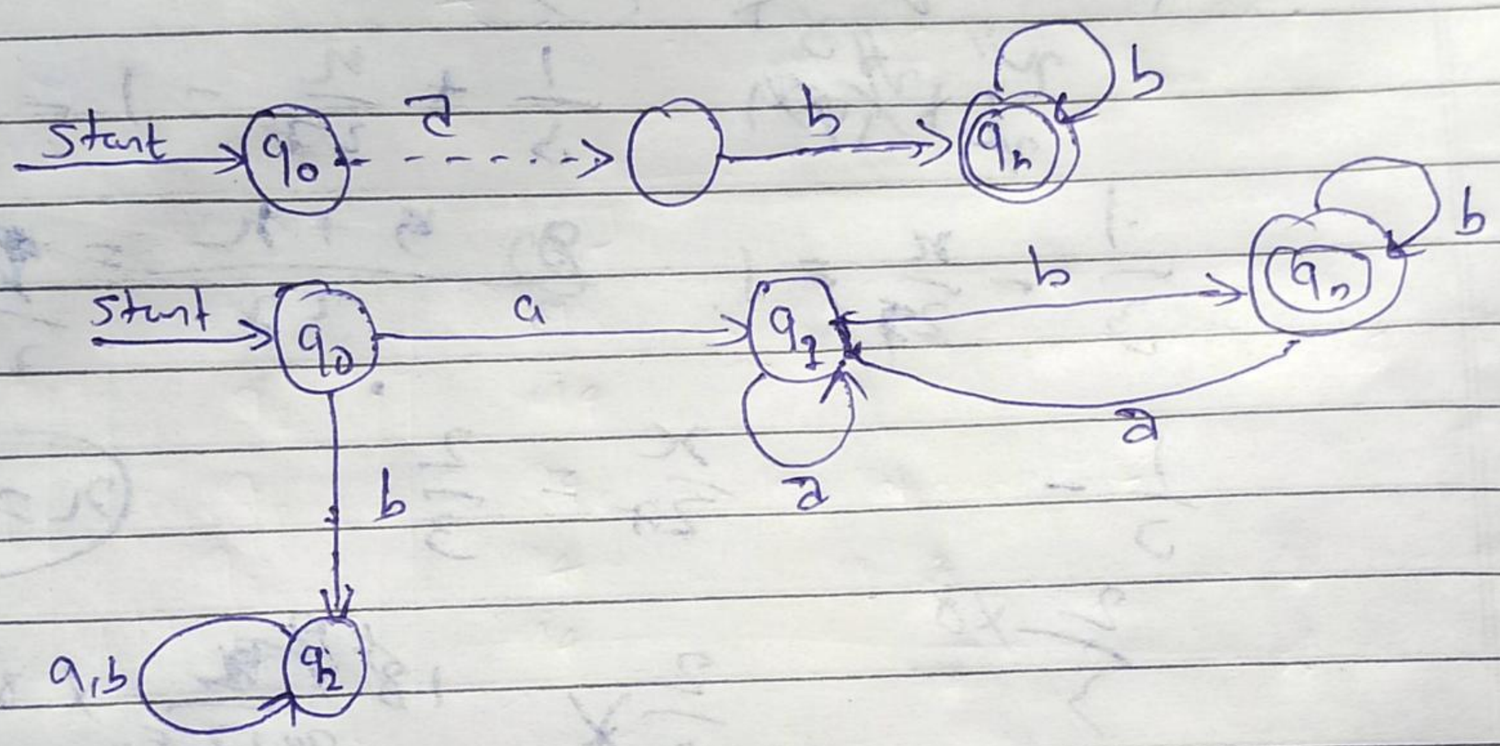
Q.1 Design the finite automata which recognizes the strig starts with a and ends with b over the set of input alphabet.

Soln :-



Transition Table

input	a	b
→ q_0	q_1	q_2
q_1	q_1	q_n
q_2	q_2	q_2
(q_n)	q_1	q_n

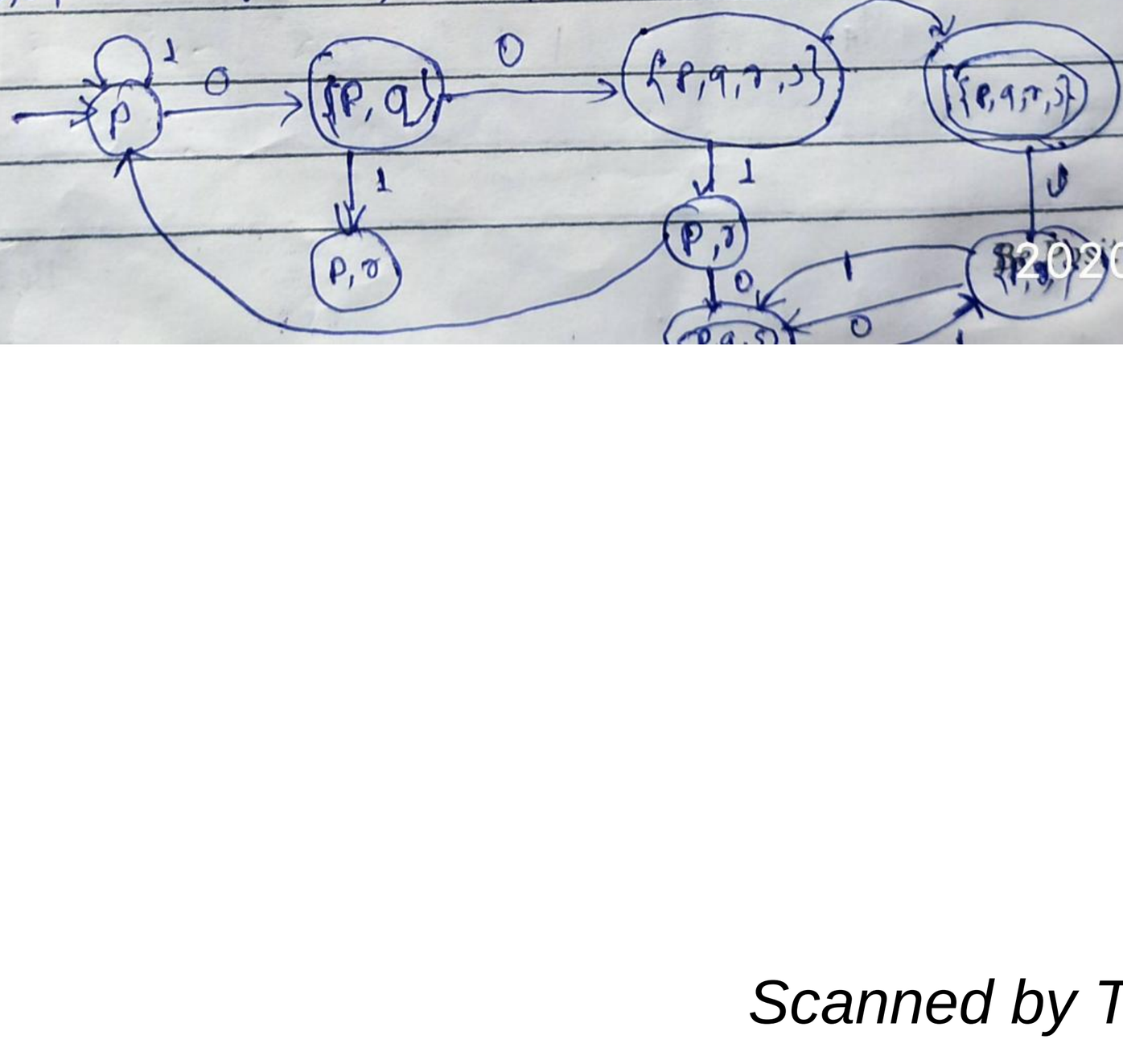
2020/8/21 12:59

Q.2. Construct NDFA equivalent to DFA

State / Input	0	1
→ P	[P, q]	P
q	r	r
r	s	ϕ
(s)	s	s

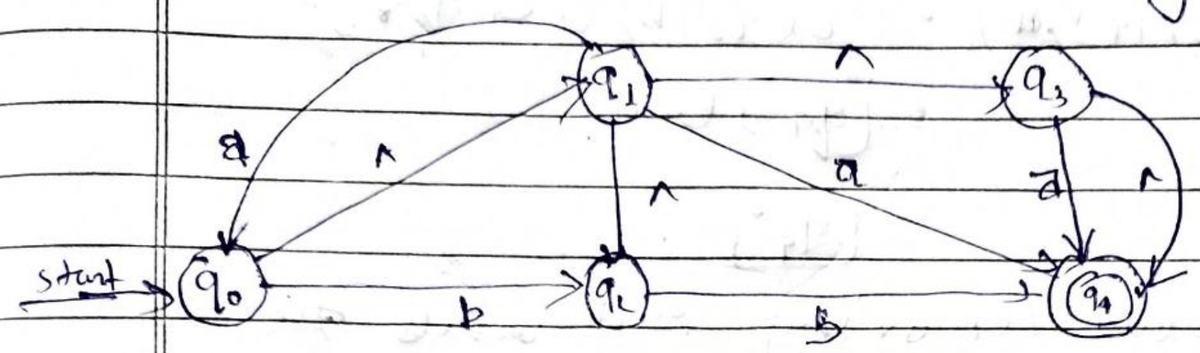
Soln:

	0	1
→ P	{P, q}	P
{P, q, r}	{P, q, r, s}	{P r}
{P, q, r, s}	{P, q, r, s}	{P, r, s}
{P, r}	{P, q, s}	{P}
{P, r, s}	{P, q, s}	{P, q, s}
{P, q, s}	{P, r, s}	{P, r, s}



DATE: __/__/____

Q 3. Remove Null moves from the following Automata



Soln ∧ = NULL Moves

For removing Null moves input symbol for DFA must be equal to the NDFA which is equal to a and b.

So, we have four states without Null without adding input = $[q_0, q_1, q_2, q_3]$

Now

$\delta([q_0, q_1, q_2, q_3], a) = \delta(q_0, a) \cup \delta(q_1, a) \cup \delta(q_2, a) \cup \delta(q_3, a)$
$= \phi \cup [q_4] \cup \phi$
$= [q_4]$

$\delta([q_0, q_1, q_2, q_3], b) = \delta(q_0, b) \cup \delta(q_1, b) \cup \delta(q_2, b) \cup \delta(q_3, b)$
$= [q_2] \cup \phi \cup [q_4] \cup \phi$
$= [q_2], [q_4]$
$= [q_2, q_4]$

$\delta([q_4], a) = \delta(q_4, a)$
$= \phi$

$\delta([q_4], b) = \delta(q_4, b)$
$= \phi$

$\delta([q_2, q_4], a) = \delta(q_2, a) \cup \delta(q_4, a)$
$= \phi \cup \phi = \phi$

DATE: __/__/____

Now $\delta([q_2, q_4], b) = \delta(q_2, b) \cup \delta(q_4, b)$

$= [q_4] \cup \phi$

$= [q_4]$

Now ~~without~~ removing null values the new states are

$[q_0, q_1, q_2, q_3], [q_4]$ and $[q_2, q_4]$

Q.4:

Present state	Next state			
	input = 0		input = 1	
	state	output	state	output
q_1	q_3	0	q_2	0
q_2	q_1	1	q_4	0
q_3	q_2	1	q_1	1
q_4	q_4	1	q_3	0

Soln:

q_1 is associated with only one output = 1

q_2 is " " two output i.e, = 0 and 1

q_3 " " " one output i.e, 0

q_4 " " " two output. i.e, 0 and 1

Now

Splits the single output and two outputs of a state.

i.e, q_1 has only one state so, q_1 will not split

$q_2 = q_{20}$ and q_{21}

$q_3 = q_3$

$q_4 = q_{40}, q_{41}$

Total states = $q_0, q_{20}, q_{21}, q_3, q_{40}, q_{41}$

Now constructing the table for that obtained states

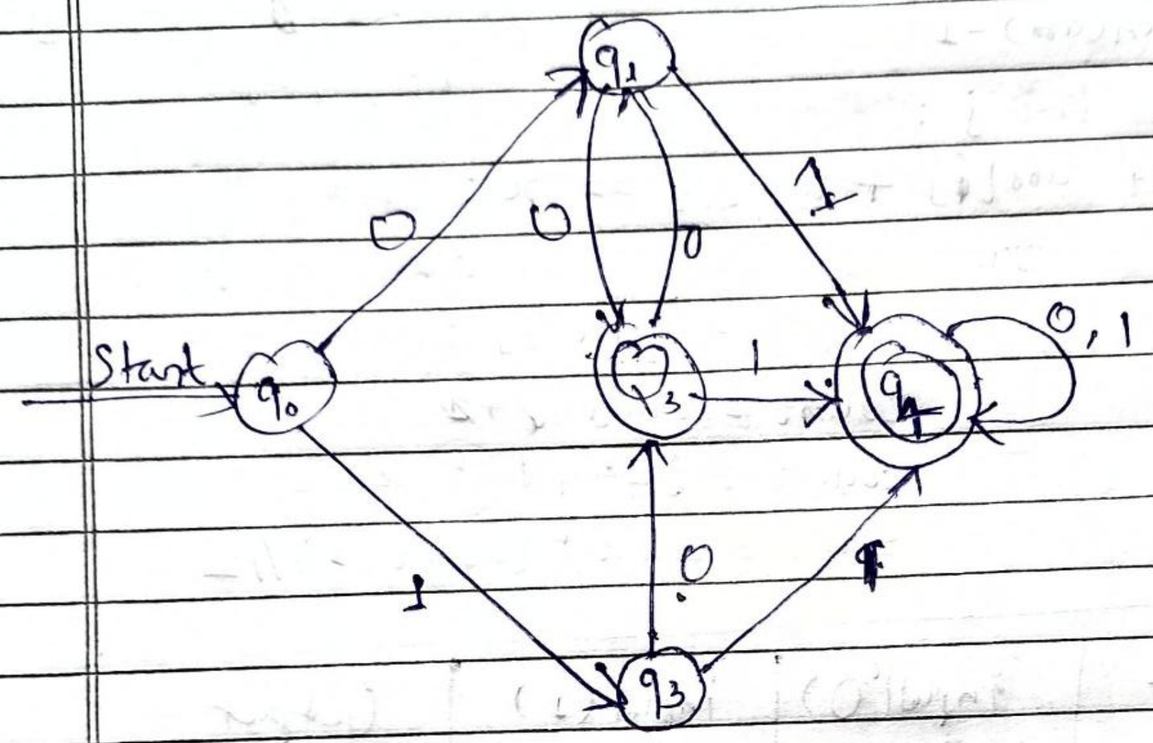
Present States	Next state			
	input (0)		input (1)	
	state	Output	state	Output
→ q_0	q_3	0	q_{20}	0
q_{20}	q_1	1	q_{40}	0
q_{21}	q_1	1	q_{40}	0
q_3	q_{21}	1	q_1	1
q_{40}	q_{41}	1	q_3	0
q_{41}	q_{41}	1	q_3	0

So States are

State	Output
q_1	1
q_{20}	0
q_{21}	1
q_3	0
q_{40}	0
q_{41}	1

DATE: __/__/____

Q.5. Minimize the Finite Automata.



Soln:

State	input 0	input 1
→ q_0	q_1	q_3
q_1	q_2	q_4
q_2	q_1	q_4
q_3	q_2	q_4
(q_4)	q_4	q_4

Final states = $\{q_4\}$

non-final states = $\{q_0, q_1, q_2, q_3\}$

Total States = $\{\{q_4\}, \{q_0, q_1, q_2, q_3\}\}$

Now

State	input (0)	input (1)
→ $[q_0]$	$[q_1, q_2, q_3]$	$[q_1, q_2, q_3]$
$[q_1, q_2, q_3]$	$[q_1, q_2, q_3]$	$[q_4]$
($[q_4]$)	$[q_4]$	$[q_4]$