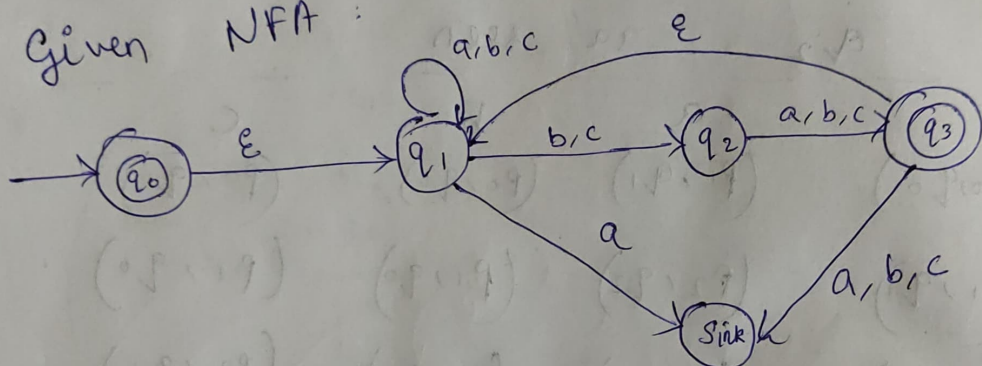NAME : RAJ SHAH

KOLL : 2021CSB065

HOME TASK 6

1) Language $L_1 = \{ w \in \Sigma^* \mid w$ is empty or second character from right of w is 'b' or 'c' $\}$

Given NFA :

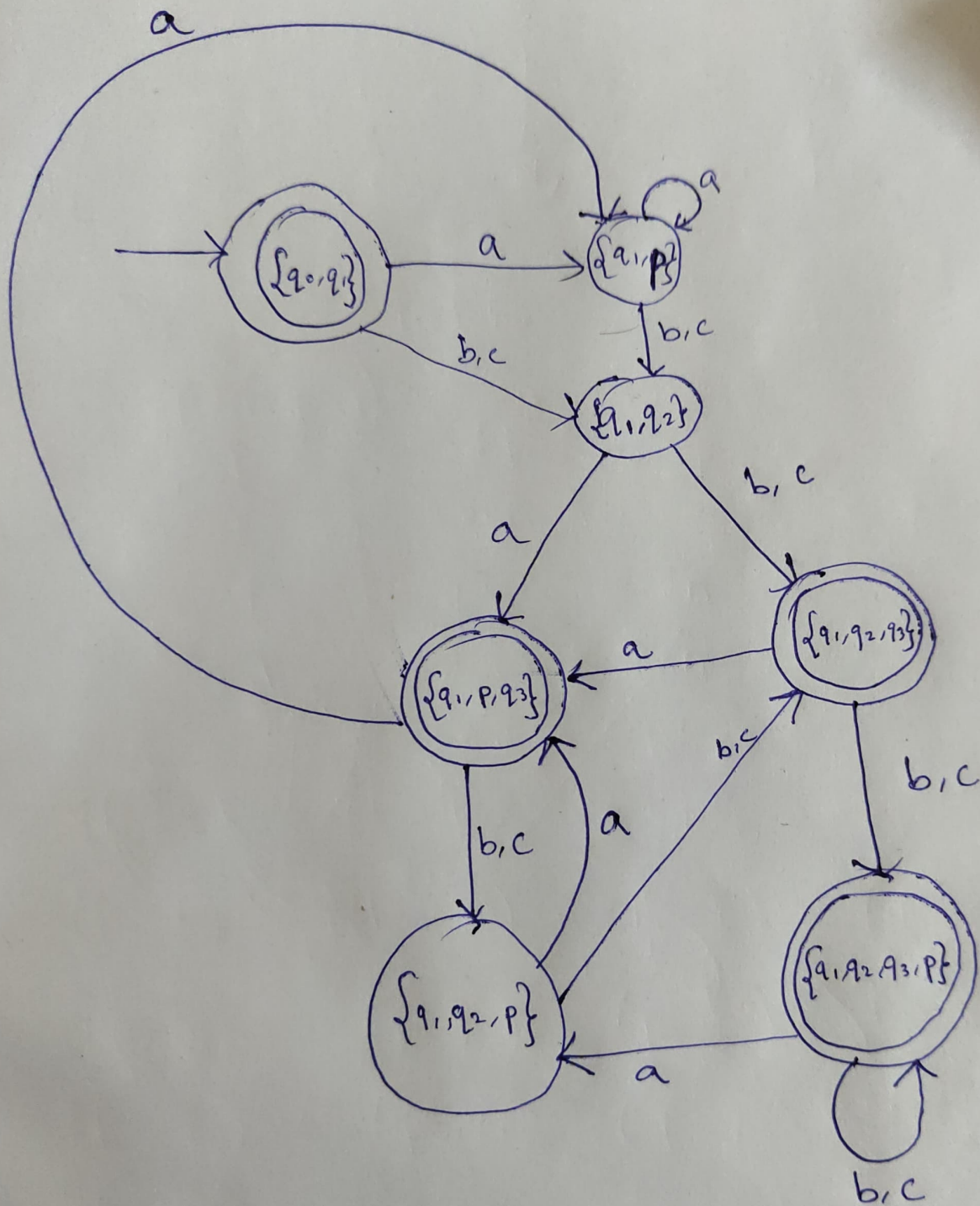Let sink be p.

Initial state can be $\{q_0, q_1\}$

Transition Table

State	a	b	c
$\{q_0, q_1\}$	$\{q_1, p\}$	$\{q_1, q_2\}$	$\{q_1, q_2\}$
$\{q_1, p\}$	$\{q_1, p\}$	$\{q_1, q_2\}$	$\{q_1, q_2\}$
$\{q_1, q_2\}$	$\{q_1, p, q_3\}$	$\{q_1, q_2, q_3\}$	$\{q_1, q_2, q_3\}$
$\{q_1, p, q_3\}$	$\{q_1, p\}$	$\{q_1, q_2, p\}$	$\{q_1, q_2, p\}$
$\{q_1, q_2, q_3\}$	$\{q_1, q_3, p\}$	$\{q_1, q_2, q_3, p\}$	$\{q_1, q_2, q_3, p\}$
$\{q_1, q_2, p\}$	$\{q_1, q_3, p\}$	$\{q_1, q_2, q_3\}$	$\{q_1, q_2, q_3\}$
$\{q_1, q_2, q_3, p\}$	$\{q_1, q_2, p\}$	$\{q_1, q_2, q_3, p\}$	$\{q_1, q_2, q_3, p\}$

DFA :

2) $L_2 = \{w \in \Sigma^* \mid w$ has $2k$ ~~eeeee~~ no. of a's where $k \in \mathbb{N}$, or w has substring "aa"$\}$

Transition table:

$(P_0, q_0) =$ Seen nothing
$P_1 =$ Odd no. of a's
$P_2 =$ Even no. of a's
$q_1 = $ "a" seen
$q_2 = $ "aa" seen

	a	b	c
(P_0, q_0)	(P_1, q_1)	(P_0, q_0)	(P_0, q_0)
(P_1, q_1)	(P_2, q_2)	(P_1, q_0)	(P_1, q_0)
(P_2, q_2)	(P_1, q_2)	(P_2, q_2)	(P_2, q_2)
(P_1, q_0)	(P_2, q_1)	(P_1, q_0)	(P_1, q_0)
(P_1, q_2)	(P_2, q_2)	(P_1, q_2)	(P_1, q_2)
(P_2, q_1)	(P_1, q_2)	(P_2, q_0)	(P_2, q_0)
(P_2, q_0)	(P_1, q_1)	(P_2, q_0)	(P_2, q_0)

$(P_0, Q_0) \longrightarrow$ Seen nothing

$P_1 \longrightarrow$ Odd a's

$P_2 \longrightarrow$ Even a's

$q_1 \longrightarrow$ "a"

$q_2 \longrightarrow$ "aa"