CS352 Theory of Automata and Formal Language

Class: BSCS 13-B

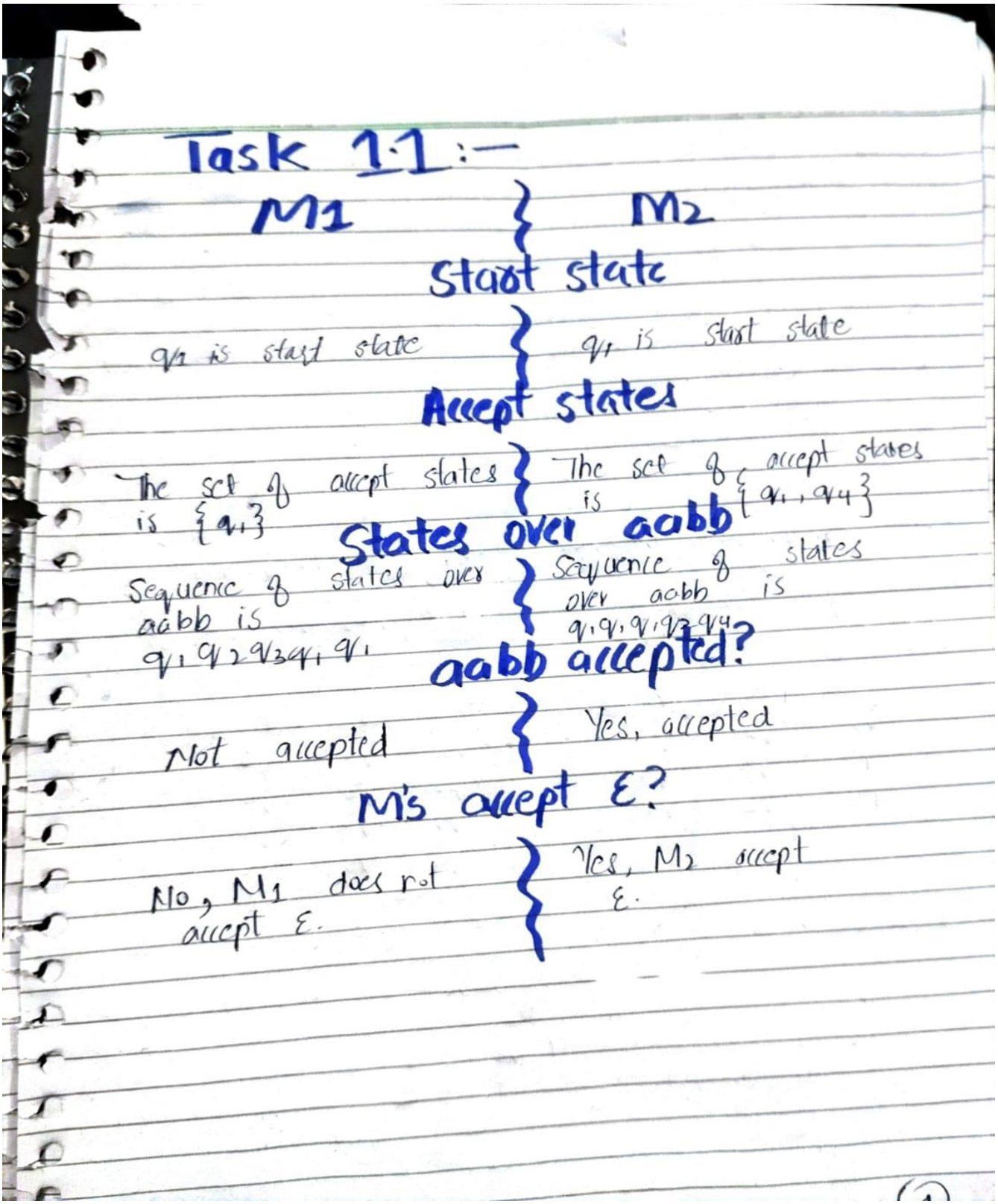
Assignment # 1

Instructor: Mr. Sohail Iqbal

Name: Aakash

Qalam Id: 471368

Exercise 1.1:


Task 1.1 :-
M1
M2
Start state
q1 is start state
q1 is start state
Accept states
The set of accept states is {q1}
The set of accept states is {q1, q4}
States over aabb
Sequence of states over aabb is q1 q2 q3 q4 q1
Sequence of states over aabb is q1 q1 q1 q2 q4
aabb accepted?
Not accepted
Yes, accepted
M's accept ε?
No, M1 does not accept ε.
Yes, M2 accept ε.

Exercise 1.2:

Task 1.2 :-

General form:

$$(Q, \Sigma, \delta, q, F)$$

Q = set of finite states
Σ = set of alphabets
δ = transition
q_0 = start state
F = final state

M1

$M_1 = (\{q_1, q_2, q_3\}, \{a, b\}, \delta_1, q_1, \{q_2\})$

$\delta_1 =$

	a	b
q_1	q_2	q_1
q_2	q_3	q_3
q_3	q_2	q_1

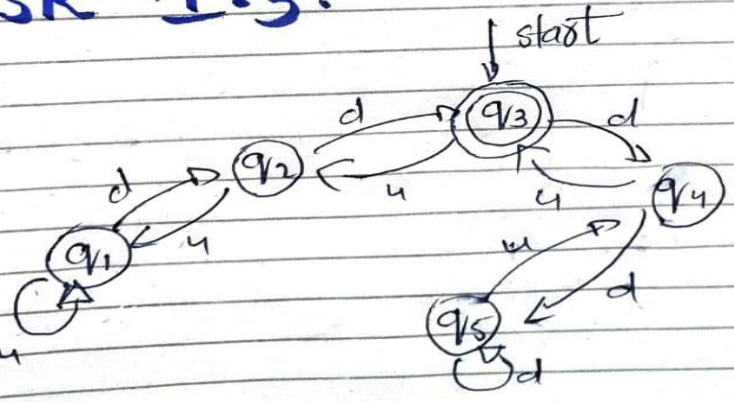
M2

$M_2 = (\{q_1, q_2, q_3, q_4\}, \{a, b\}, \delta_2, q_1, \{q_1, q_4\})$

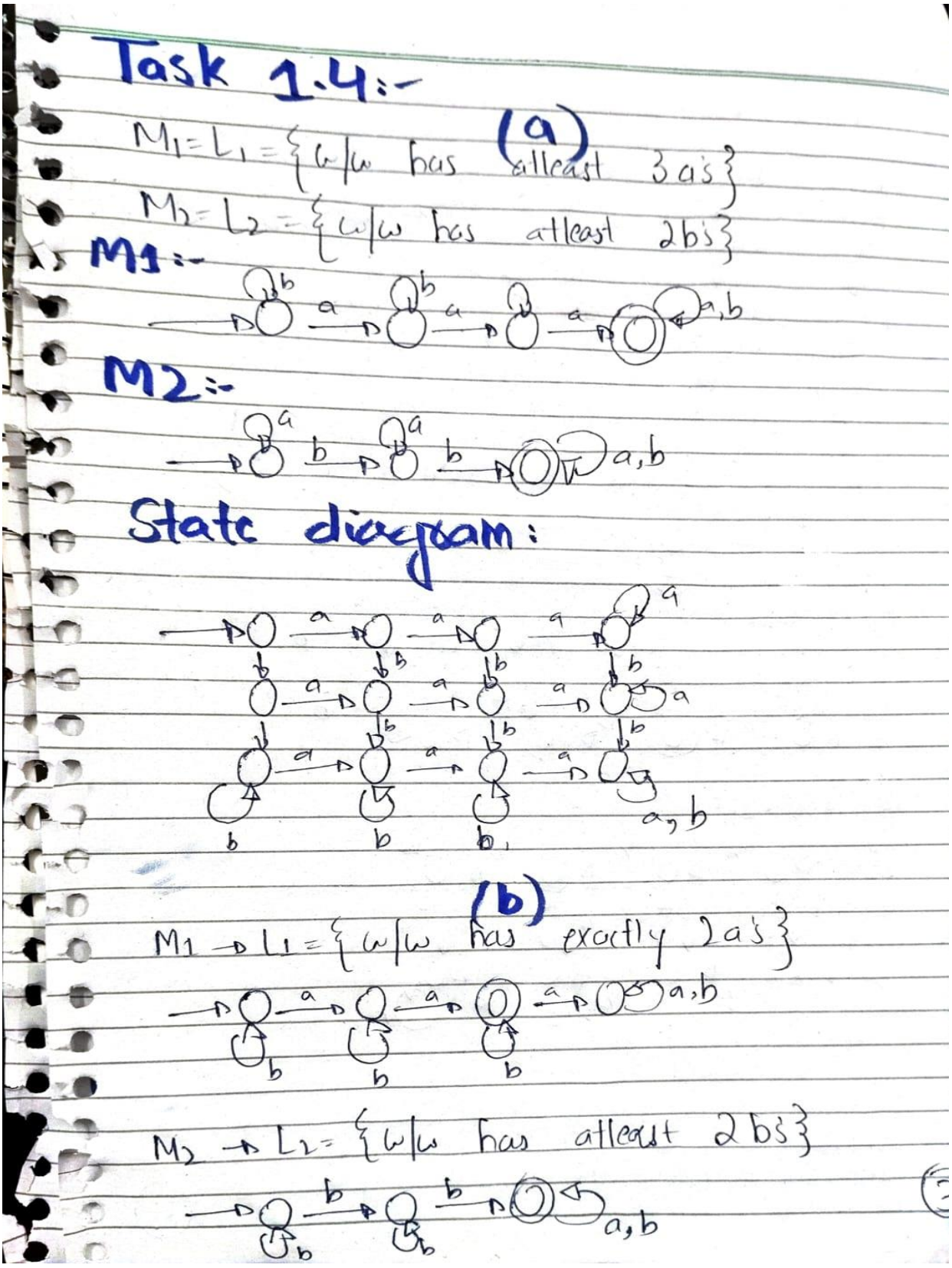
$\delta_2 =$

	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

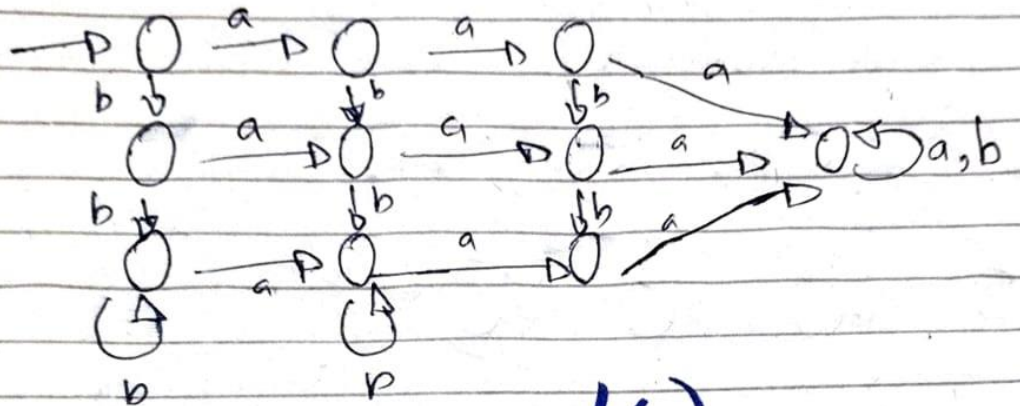
Task 1.3:



Exercise 1.4:

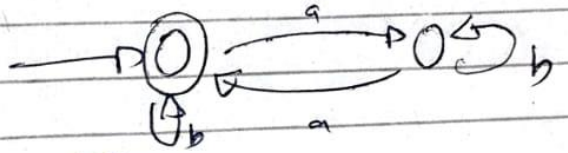

Task 1.4:-
(a)
M1 = L1 = {w/w has atleast 3 a's}
M2 = L2 = {w/w has atleast 2 b's}
M1:-
M2:-
State diagram:
(b)
M1 → L1 = {w/w has exactly 2 a's}
M2 → L2 = {w/w has atleast 2 b's}

$M_1 \cap M_2$:

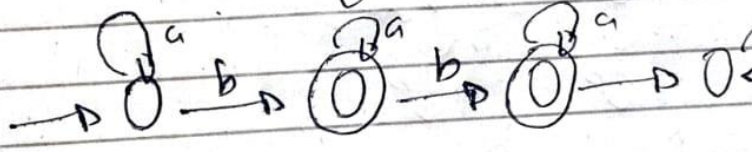


(c)

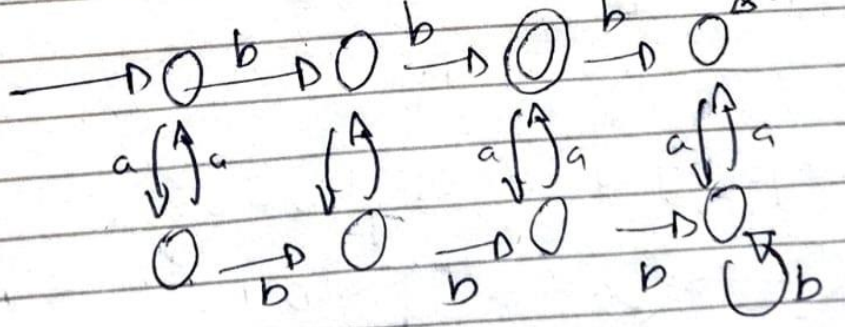
$M_1 = L_1 = \{w \mid w$ has even # of a's$\}$



$M_2 = L_2 =$ $\{w \mid w$ has one/two b's$\}$

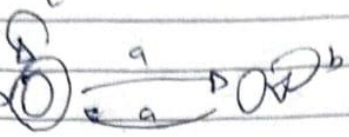


$M_1 \cap M_2$:

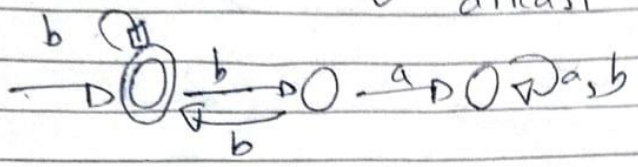


(d)

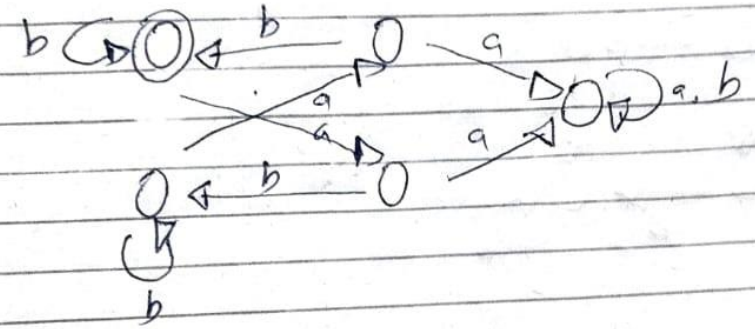
$M_1 = L_1 = \{ w/w$ has even # of a's$\}$



$M_2 = L_2 = \{ w/w$ each a is followed by atleast 1 b$\}$

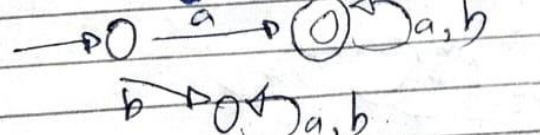


$M_1 \cap M_2 =$

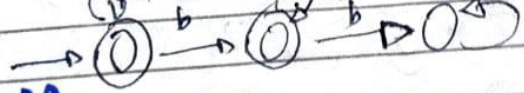


(e)

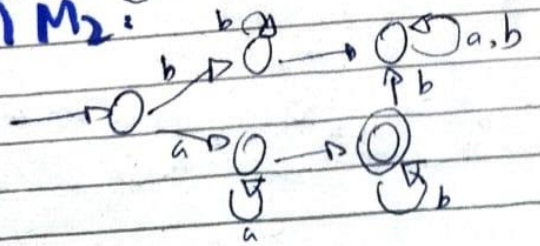
$M_1 = L_1 = \{ w/w$ start with a$\}$



$M_2 = L_2 = \{ w/w$ has atmost 1 b$\}$

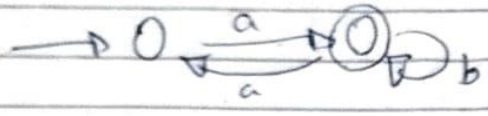


$M_1 \cap M_2 :$

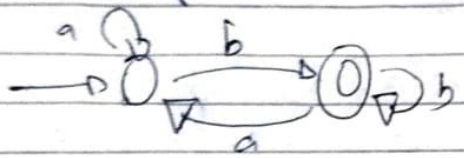


(f)

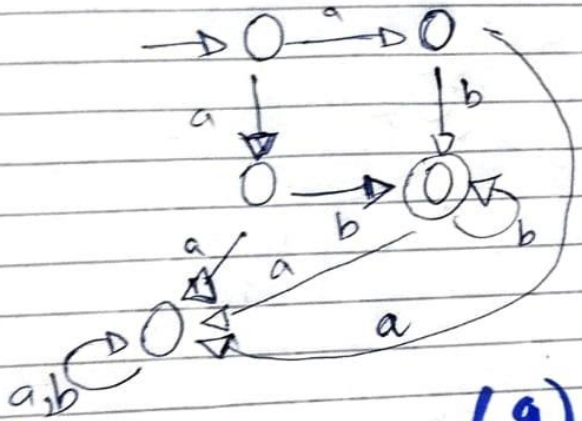
$M_1 = L_1 = \{ w \mid w$ has odd # of a's $\}$



$M_2 = L_2 = \{ w \mid w$ ended with b $\}$

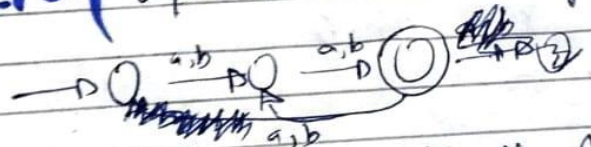


$M_1 \cap M_2$:

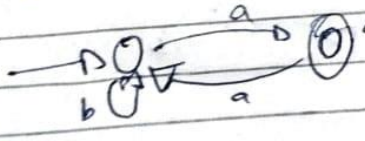


(g)

$M_1 = L_1 = \{ w \mid w$ has even length $\}$

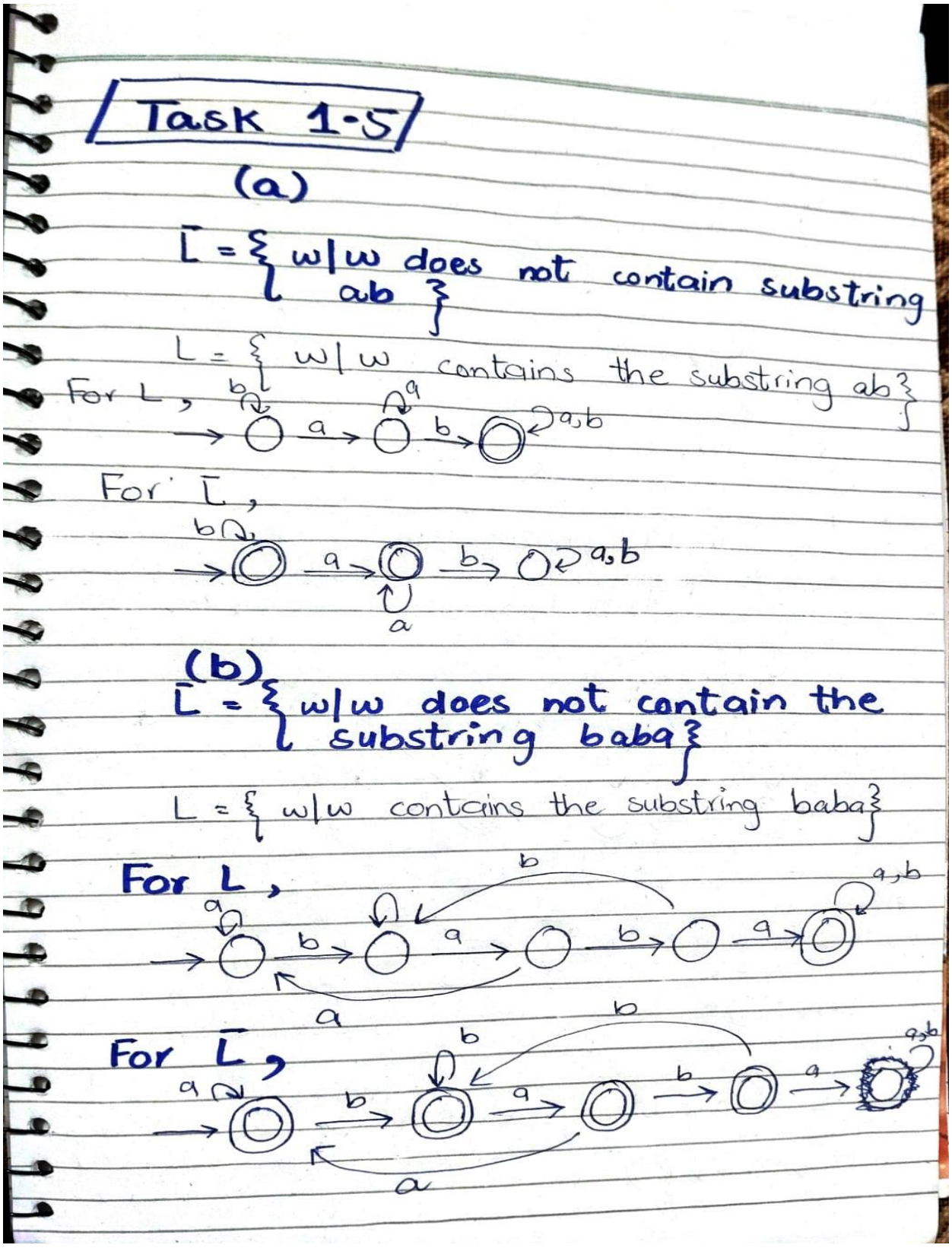


$M_2 = L_2 = \{ w \mid w$ has odd # of a's $\}$



$M_1 \cap M_2$:

Exercise 1.5:

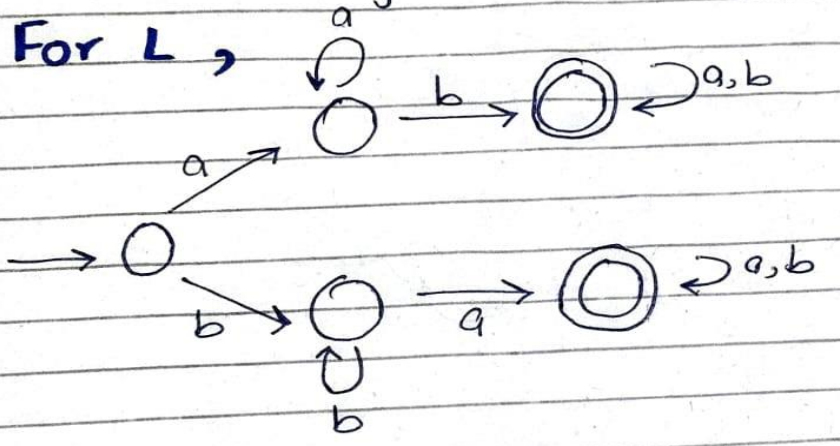

Task 1-5
(a)
L = { w | w does not contain substring ab }
L = { w | w contains the substring ab }
For L,
For L̄,
(b)
L = { w | w does not contain the substring baba }
L = { w | w contains the substring baba }
For L,
For L̄,

(c)

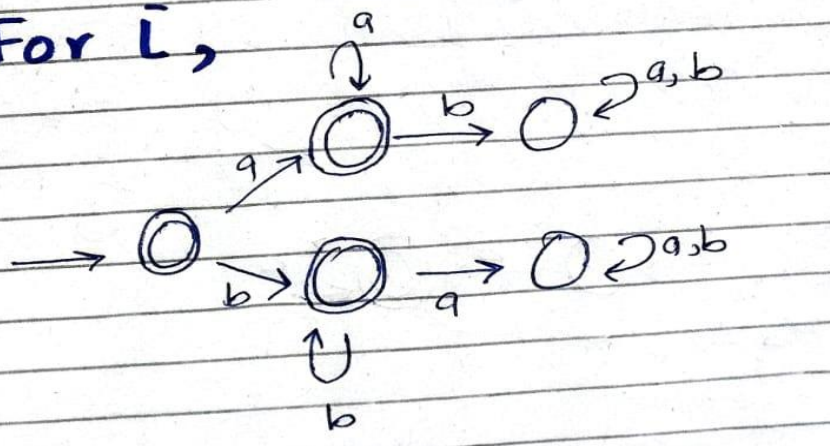
$\bar{L} = \{ w \mid w$ contains neither ab nor ba $\}$

$L = \{ w \mid w$ contains either ab or ba $\}$

For L,



For $\bar{L}$,

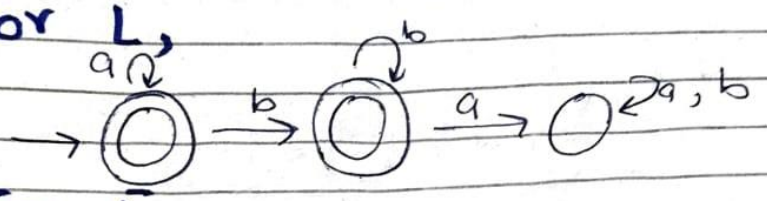


(d)

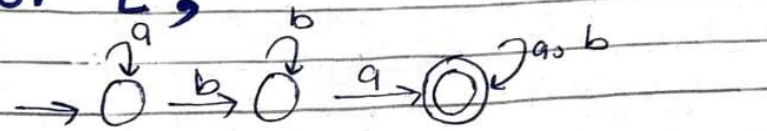
$\bar{L} = \{ w \mid w \text{ is any string not in } a^*b^* \}$

$L = \{ w \mid w \text{ is any string in } a^*b^* \}$

For L,



For $\bar{L}$,

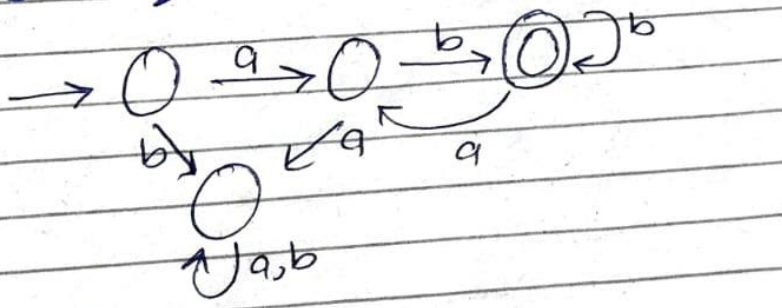


(e)

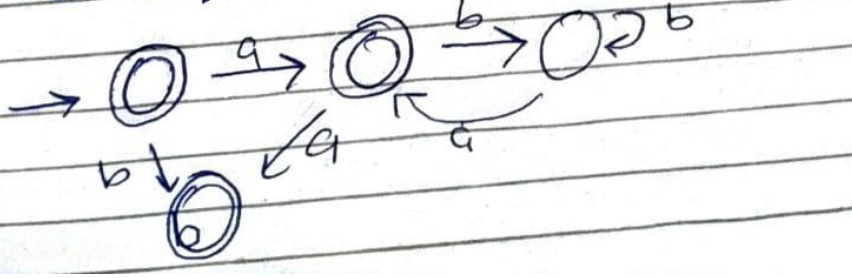
$\bar{L} = \{ w \mid w \text{ is any string not in } (ab^+)^* \}$

$L = \{ w \mid w \text{ is any string } (ab^+)^* \}$

For L,



For $\bar{L}$,

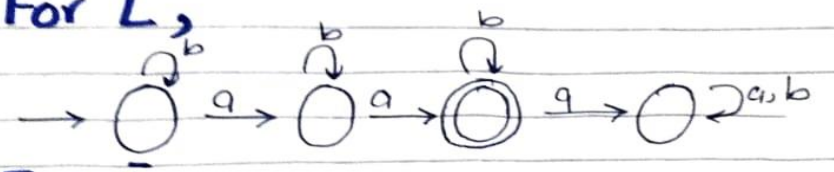


Exercise 1.6:

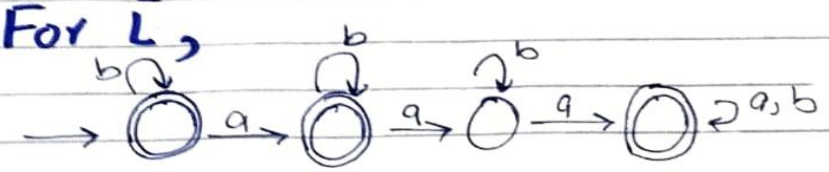
(g) $\bar{L} = \{ w \mid w \text{ is any string that does not contain exactly two a's} \}$

$L = \{ w \mid w \text{ is any string that does contain exactly two a's} \}$

For L,

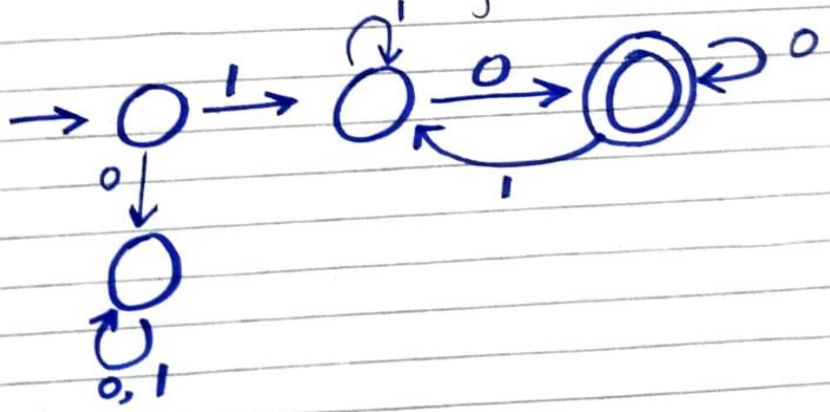


For $\bar{L}$,

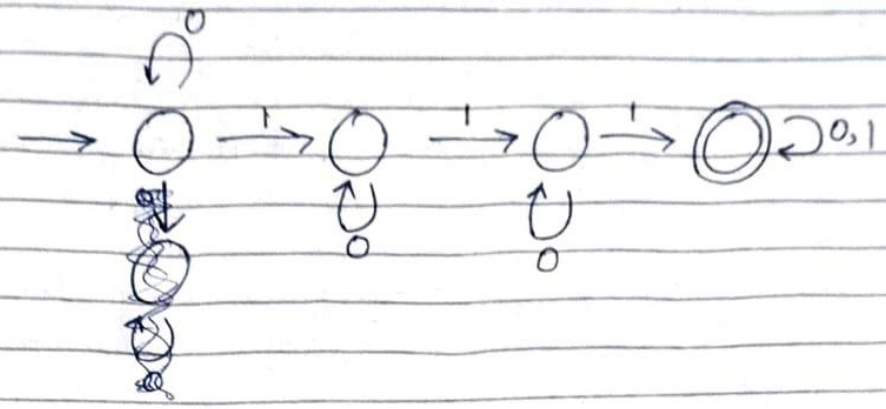


Task 1.6

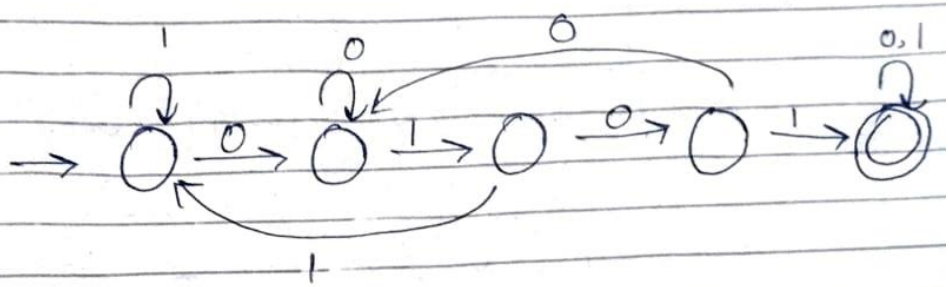
(a) $L = \{ w \mid w \text{ begins with a 1 and ends with a 0} \}$



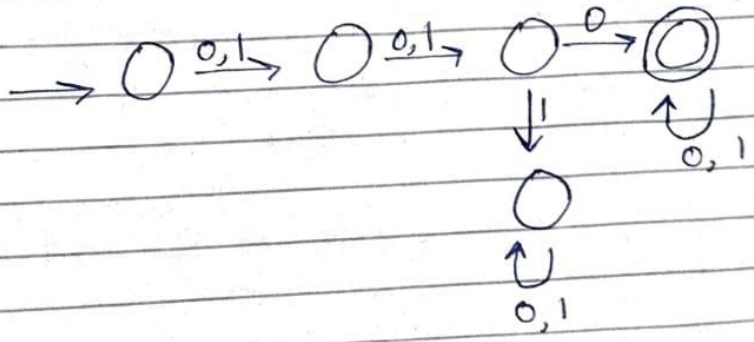
(b)



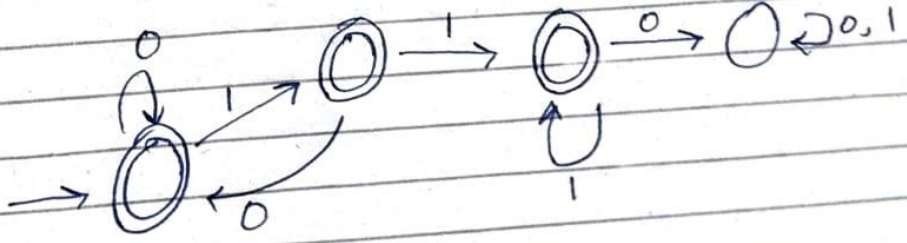
(c)



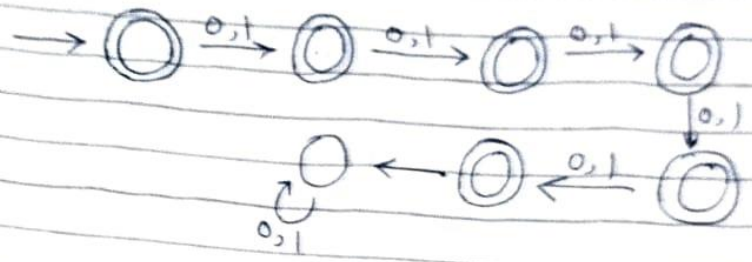
(d)



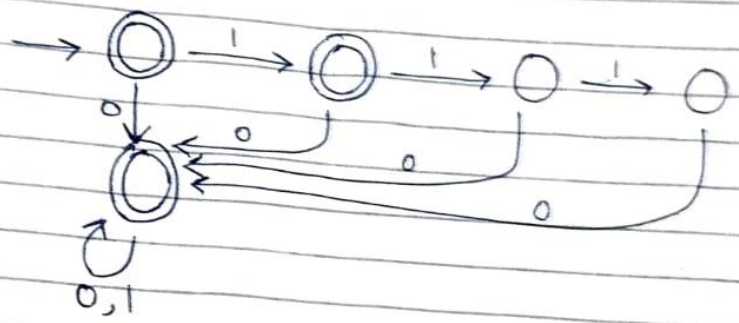
(f)



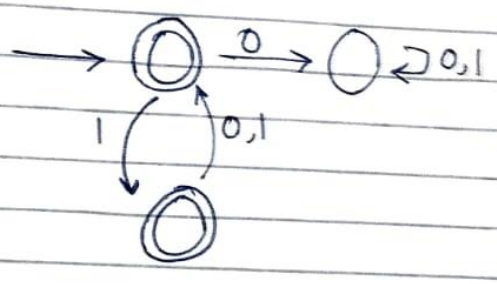
(g)



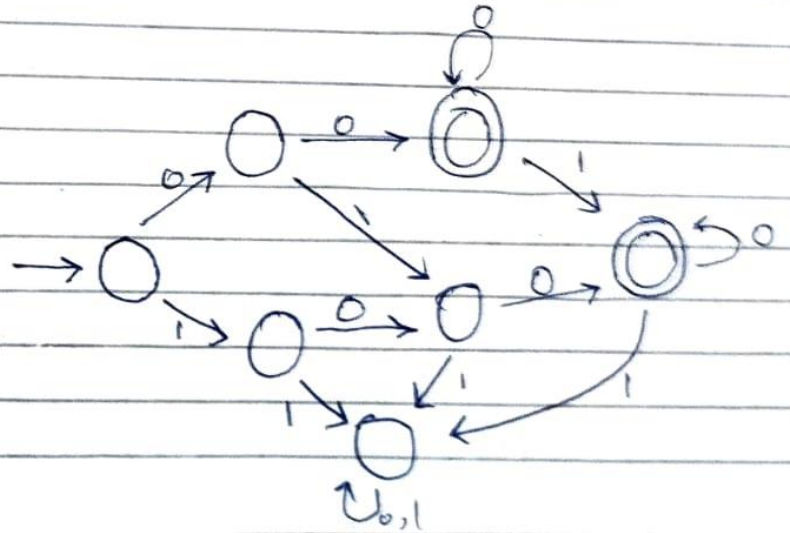
(h)



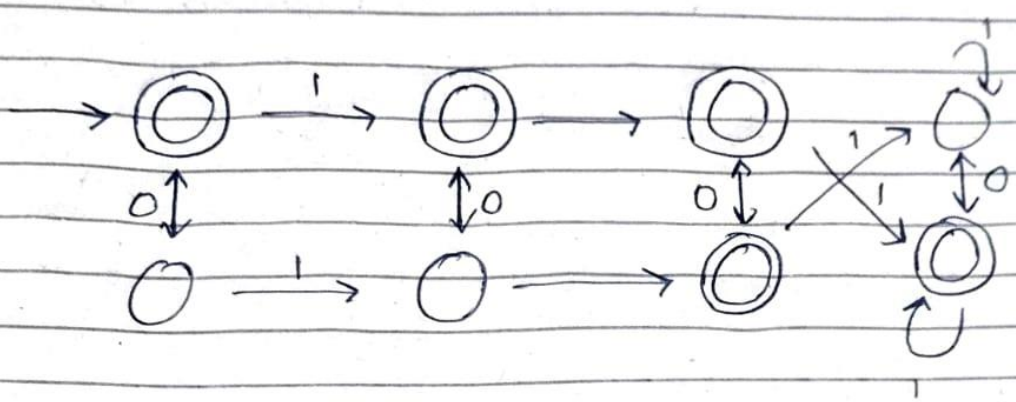
(i)



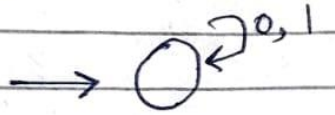
(j)



(l)



(m)



(n)