Tutorial-1

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① if "P represents This book is good" and "Q represents This book is cheap" write following sentances in symbolic for

1] This book is good and cheap
2] This book is noot got but cheap
3] costly but good
4] neither good nor cheap
5] either good or cheap

② Construct truth table $((P \vee Q) \rightarrow (P \vee R) \rightarrow (R \vee Q))$

③ Show that $(P \wedge Q) \vee (P \wedge \neg Q) \equiv P$

④ obtain a disjunctive normal form of
$P \vee (\neg P \rightarrow (Q \vee (Q \rightarrow \neg R))$

⑤ find disjuctive normal function

P	Q	R	α
T	T	T	T
T	T	F	F
T	F	T	F
T	F	F	T
F	T	T	T
F	T	F	F
F	F	T	F
F	F	F	T

* Lexical Analysis
* Syntex Analysis
* ~~Sy~~ Semantic Analysis
* Code optimization

] Platform Independent

* code generation] Machine dependent

$P \to Q$ if P then Q - jaha $P \to T$ to vaha Q ki value likh to remain T

$P \leftrightarrow Q$ P is equivalent to Q

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① i] $P \land Q$ ii] $\neg P \land Q$

iii] $P \land \neg Q$ iv] $\neg P \land \neg Q$ or $\neg(P \lor Q)$

v] $P \lor Q$

② $(P \cup Q) \to (P \cup R) \to (R \lor Q)$

P	Q	R	$P \lor Q$	$P \lor R$	$R \lor Q$	$(P \lor Q) \to (P \lor R)$	$(P \lor Q) \to (P \lor R) \to (R \lor Q)$
0	0	0	0	0	0	1	0
0	0	1	0	1	1	1	1
0	1	0	1	0	1	0	1
0	1	1	1	1	1	1	1
1	0	0	1	1	0	1	0
1	0	1	1	1	1	1	1
1	1	0	1	1	1	1	1
1	1	1	1	1	1	1	1

③ $(P \land Q) \lor (P \land \neg Q)$

P	Q	$P \land Q$	$\neg Q$	$P \land \neg Q$	$(P \land Q) \lor (P \land \neg Q)$
0	0	0	1	0	0
0	1	0	0	0	0
1	0	0	1	1	1
1	1	1	0	0	1

④ disjuctive Normal form

$(a \land b) \lor (\neg a \land b \land \neg c) \to$ product ka sum

product sum

$(\neg a \land b (\lor c) \to$ X

Sum not allowed in product

$((a \land b \land (c \lor \neg c)) \Rightarrow (a \land b \land c) \lor (a \land b \land \neg c)$

$A \lor \neg A$ = True , $A \land \neg A$ = False

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* Equivalance of WFF - two WFF α and β are set to be equivalent if α equilite β is totology ($\alpha \equiv \beta$)

* Logical Identities -

$\alpha = (Q \to R) \vee (P \to R) \wedge (P \vee Q) \wedge (Q \to P) \leftrightarrow (P \vee R)$

$\beta - (P \to Q) \leftrightarrow R$

Identites-

1. (i) $(P \vee P) \equiv P$, (ii) $(P \wedge P) \equiv P$
2. $(P \vee Q) \equiv (Q \vee P)$, $(P \wedge Q) \equiv (Q \wedge P)$
3. $(P \vee Q) \vee R \equiv P \vee (Q \vee R)$, $P \wedge (Q \wedge R) \equiv (P \wedge Q) \wedge R$
4. $P \vee (Q \wedge R) \equiv (P \vee Q) \wedge (P \vee R)$, $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$
5. $P \vee (P \wedge Q) \equiv P$, $P \wedge (P \vee Q) \equiv P$
6. $\neg (P \vee Q) \equiv \neg P \wedge \neg Q$, $\neg (P \wedge Q) \equiv \neg P \vee \neg Q$
7. $P \equiv \neg(\neg P)$
8. $P \vee \neg P \equiv T$
9. $P \vee T \equiv T$, $P \vee F \equiv P$

   $P \wedge T \equiv P$, $P \wedge F \equiv F$
10. $(P \to Q) \wedge (P \to \neg Q) \equiv \neg P$
11. $P \to Q \equiv \neg Q \to \neg P$
12. $P \to Q \equiv \neg P \vee Q$

Q $(P \wedge Q) \vee (P \wedge \neg Q) \equiv P$

Sentence into Propositional Form-

Let P be the propositional variable for P = it is rainy

Q = I have the time , R = I will go to a movie

1. I will not go to movie if it is rainy
2.

$(P \vee Q \vee \neg Q \vee \neg R)$

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Normal Form of WFF -

① Disjuctive Normal Form - ② Conjuctive Normal Form

Steps -

(i) Eleminate implication and equality using logical Identities

(ii) Eliminate negation before sums and product. the resulting formula as negation only before the propogation value

(iii) Use above steps to obtain the formula for sum of product of literals.

Q. $P \vee (\neg P \rightarrow (Q \vee (Q \rightarrow \neg R)))$, Convert this Conjuctive normal form to Disjoint normal function.

$P \vee (\neg P \rightarrow (Q \vee (Q \rightarrow \neg R)))$

$\Rightarrow P \vee (\neg P \rightarrow (Q \vee (\neg Q \vee \neg R)))$ $\{P \rightarrow Q = \neg P \vee Q)$

$\Rightarrow P \vee (\neg P \rightarrow (Q \vee \neg Q) \vee \neg R)$

$P \vee \neg(\neg P) \vee Q \vee \neg Q \vee \neg R$

$P \vee P \vee Q \vee \neg Q \vee \neg R$

$P \vee Q \vee \neg Q \vee \neg R$

Tutorial-2

① Let $R = \{(1,2), (2,3), (2,4)\}$ be a relation in $\{1,2,3,4\}$. find R^+

② If $A = \{a, b\}$ and $B = \{b, c\}$, find

ⓐ $(A \cup B)^*$ ⓑ $(A \cap B)^*$
ⓒ $A^* \cup B^*$ ⓓ $A^* \cap B^*$
ⓔ $(A - B)^*$ ⓕ $(B - A)^*$

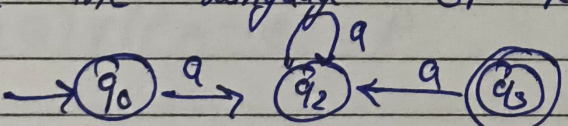
③ A finite automation M has state set $Q = \{q_0 : q_1 : q_2\}$. Its input alphabet is $\Sigma = \{0 : 1\}$, with q_0 being the initial state and $F = \{q_0\}$. The transition f^n δ is given by the following transition table.

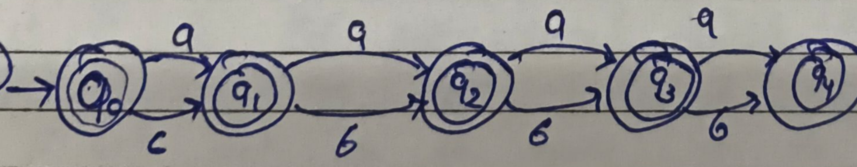
δ	0	1
q_0	q_2	q_1
q_1	q_1	q_0
q_2	q_2	q_2

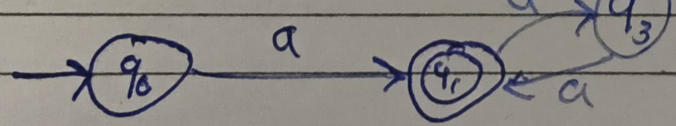
Give the state diagram for M and describe the Language $L(M)$.

④ Sheep go "baa!" or "baaa!" and so on. They do not go "baaa" or "ba!" or "!" or "". Construct a finite automation (with input alphabet $\Sigma = \{a; b; !\}$) that recognizes "Sheep - talk".

⑤ Find the language of following FA:

ⓐ 

ⓑ 

ⓒ 

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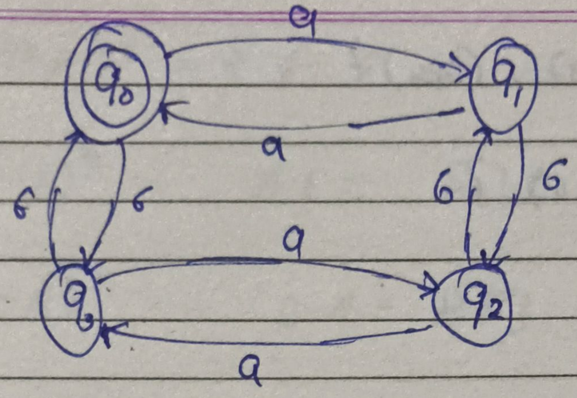
(d)



(6) Find the FA of following language.

(a) $L = \{a^{2n} \mid n \geq 0\}$

(b) $L = \{a^n b^m \mid n, m \geq 0\}$

(c) $L = \{a, b, aa, bb, aaa, bbb, \ldots\}$

(d) $L = \{$ Set of all strings over $\{0, 1\}$ starting with 0 ending with 1 $\}$

Ans-2. $A = \{a, b\}$, $B = \{b, c\}$

(1) $\Rightarrow (A \cup B)^*$ $\Rightarrow A \cup B = abc \Rightarrow (A \cup B)^* = \emptyset$

Ans-1

(1) $R = \{(1,2), (2,3), (2,4)\}$

$S = \{1, 2, 3, 4\}$ R^+ = transative closer

$A \cdot B \Rightarrow$ if $\langle a.b \rangle \in A$ and $\langle b.c \rangle \in B$ then $\langle a.c \rangle \in A.B$

but if $\langle a.c \rangle \in A$ or $\langle a.c \rangle \in B$ then $\langle a.c \rangle \notin A.B$

$R^2 = R \cdot R$, $R^3 = R^2 \cdot R$

$R^+ = R \cup R^2 \cup R^3 \ldots\ldots$

$1,2 \to 23$
$1,2 \to 2,4$

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Sol-1 $R = \{(1,2), (2,3), (2,4)\}$

$R^2 = R \cdot R = \{(1,3), (1,4)\}$

$R^3 \Rightarrow R^2 \cdot R = \phi$
$R^4 \Rightarrow R^3 \cdot R = \phi$ - - -

$R^+ = \{(1.2), (2,3), (2,4), (1.3), (1,4)\}$

Sol-2 $A = \{a, 6\}$, $B = \{6, c\}$
$S = \{a, 6, c\}$

~~① $(A \cup B)^* \Rightarrow A \cup B = a6c$ $\Rightarrow (A \cup B)^* = \phi$~~

~~② $(A \cap B)^* \Rightarrow A \cap B = 6$ $\Rightarrow (A \cap B)^* = \{a, c\}$~~

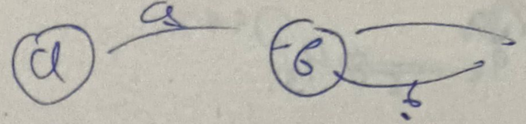
~~③ $A^* \cup B^* \Rightarrow$~~

X^* = kleene closear or kleene star
$x = \{a, 6\}$
$x^* = \{\phi, a, 6, aa, a6, 6a, 66, aaa - - - - - \}$

① $(A \cup B)^*$ - $A \cup B = a6c$
$(A \cup B)^* = \{\phi, a, 6, c, a6, 6c, aa, 66, cc, ca, aaa - - - - - \}$
Set of all strings

② $(A \cap B)^*$ = $A \cap B = 6$
$(A \cap B)^* = \{\phi, 6, 66, 666, - - - - \}$

③ $A^* \cup B^*$ = $A^* = \{\phi, a, 6, a6, 6a, aa, 66 \ldots - \}$
$B^* = \{\phi, 6, c, 66, cc, 6c, c6 - - \}$
$A^* \cup B^* = \{\phi, a, 6, c, aa, 66, cc, a6, 6c, 6a, c6 \ldots\}$
Set of all the string over either $\{a, 6\}$ or $\{6, c\}$

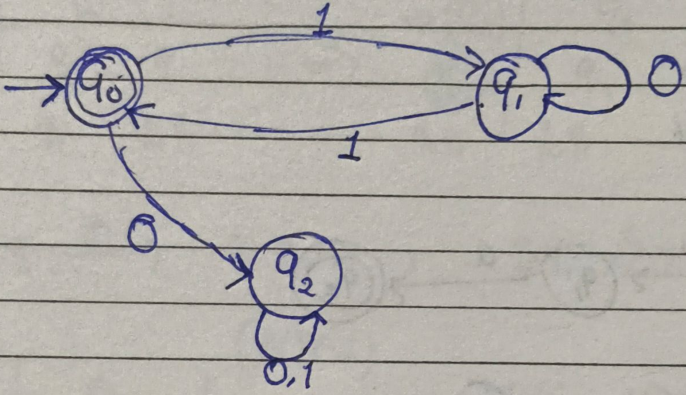


(5) $A^* \cap B^* = \{\phi, b, bb, bbb, ------\}$

(3) $(A-b)^* = A \cdot b = \{a\} \Rightarrow a^*$

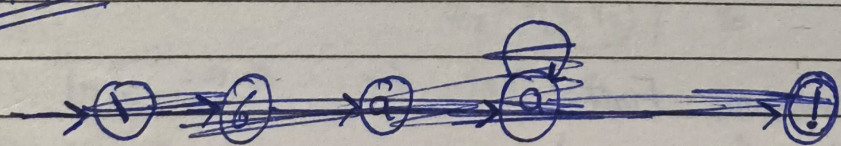
(8) $(B-A)^* = B-A = \{c\} \Rightarrow c^*$

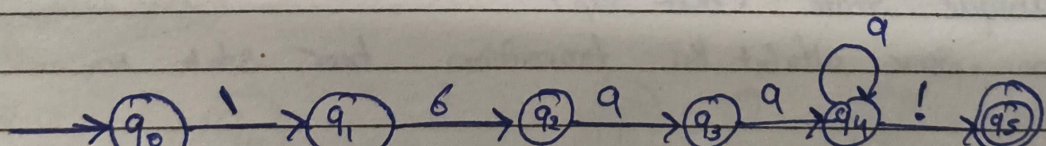
Q-3



$\Rightarrow (10^*1)^*$, starts and ends with 1 and all other 1's will appear in pairs

Sol-4



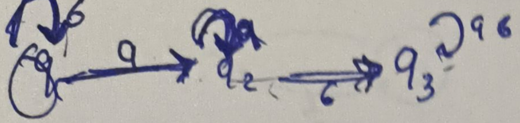


Sol-5

i) Null

ii) $\{\phi, (a+b), (a+b)(a+b), (a+b)(a+b)(a+b), ...\}$
set of all string over a and b with max length 4.

$L = \{x \in \{a,b\}^* \mid |x| \leq 4\}$



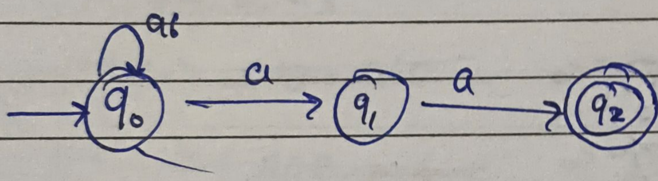
③

$a^* = \{ \epsilon, a, aaa, aaaaa, \ldots \}$

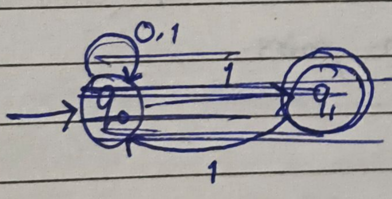
$L = \{ a^n \mid n \text{ is odd number} \}$

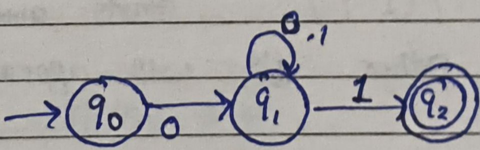
④ no of a's and no. of b's are even.

Q aa at last



Q 0 start end ①





DFA - Deterministic Finite

i. Unique state (next step)

ii] then Sare alfabet ka transition har state me

The equivalance of NDFA and DFA (Conversion from NDFA to DFA)

i] The DFA can simulate the behavior of NDFA by increasing the no. of states.

ii) Any NDFA is similar to DFA having Same Capabilities

iii) If L is the set of accepted language of NDFA then we can find a DFA which Accept the same language

Ex

State	0	1
$\rightarrow q_0$	q_0	q_1
q_1	q_1	$q_0 q_1$

$\Rightarrow$

	0	1
$\rightarrow q_0$	q_0	q_1
q_1	q_1	$q_0 q_1$
$q_0 q_1$	$q_0 q_1$	$q_0 q_1$

$q_0 q_1 \xrightarrow{0} q_0 q_1$, $q_0 q_1 \xrightarrow{1} q_1 \cup (q_0 q_1) \Rightarrow q_0 q_1$

Ex

(NDFA)

State	0	1
$\rightarrow q_0$	$q_0 q_1$	q_2
q_1	q_0	q_1
q_2	–	$q_0 q_1$

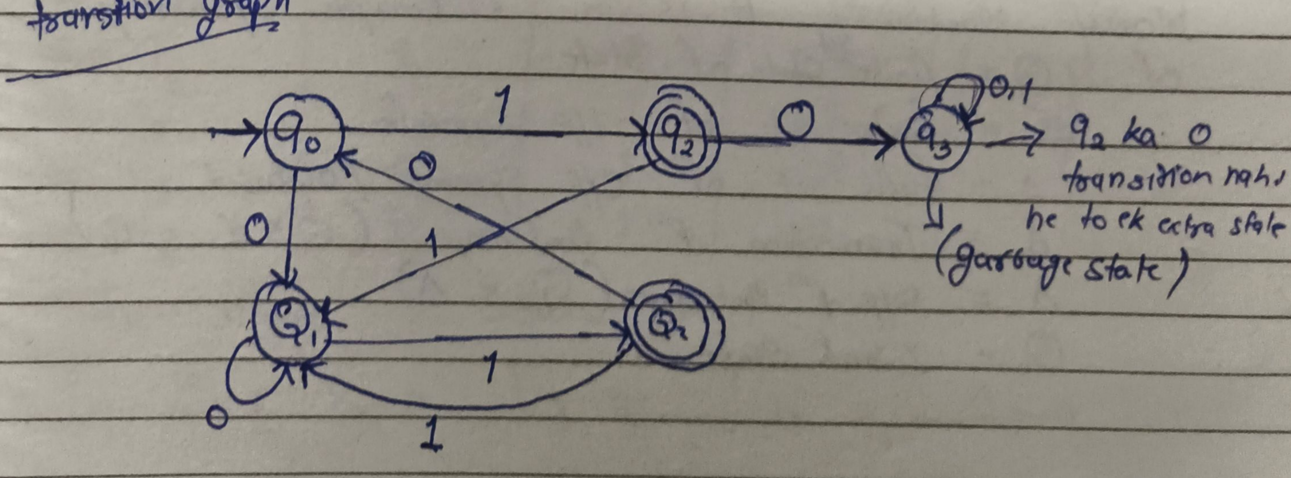
$\Rightarrow$

(DFA)

State	0	1
$\rightarrow q_0$	$q_0 q_1$	q_2
q_2	–	$q_0 q_1$
$Q_1 \rightarrow q_0 q_1$	$q_0 q_1$	$q_1 q_2$
$Q_2 \rightarrow q_1, q_2$	q_0	$q_0 q_1$

$q_0 q_1 \xrightarrow{} 0 \Rightarrow q_0 q_1 \cup q_0$, $q_0 q_1 \xrightarrow{1} q_2 q_1$

transition graph



$(q_0) \xrightarrow{a} (q_1) \xrightarrow{b} (q)$

a bb

aab ab b

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Q $L = a^n b^n$

→

FA with O/P

① **Mellay Machine -**

A FA or FSA have binary output that is they accept string or they do not accept the given string. This was decided on the basis of processing of the input string from initial state to processing last symbole of the input string

We want to remove this restriction from the given FA where the o/p f^n can be choosen from, when the o/p f^n $Z(t)$ choosen from other alphabet, If o/p f^n $Z(t)$ is a f^n of present state $q(t)$ and present input symole $x(t)$ then the machine is called Mellay Machine

② **Moorey Machine**

If $Z(t) = \lambda(q(t))$, then it is called Morey Machine. it is a 6 couple quantity of

Q = finite set of state

Σ = finite set of i/p symbole

Δ - finite set of o/p symbole / alphabet

δ = Transition f^n that map's $(Q \times \Sigma = Q)$

λ = o/p f^n that map's $(Q - \Delta)$

Q_0 - Initial State

mory – 1 output → O/P associate with State
mellay – 2 output → O/P associate with transition

q_0, q_3, q_5 add 00110

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P state	Next State		O/P
	q : 0	q : 1	
→ q_0	q_3	q_1	0
q_1	q_1	q_2	1
q_2	q_2	q_3	0
q_3	q_3	q_0	0

Q. Input string = 0111 ∧ $\Sigma = \{0,1\}$, $\Delta = \{0,1\}$

$q_0 \xrightarrow{0} q_3 \xrightarrow{1} q_0 \xrightarrow{1} q_1 \xrightarrow{1} q_2 \xrightarrow{\wedge} q_2$

output → 000100

Q. Input string = 11011

$q_0 \xrightarrow{1} q_1 \xrightarrow{1} q_2 \xrightarrow{0} q_2 \xrightarrow{1} q_3 \xrightarrow{1} q_0 \xrightarrow{\wedge} q_0$

Output 010000

P state	Next state			
	a = 0		a = 1	
	State	O/P	State	O/P
→ 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

Input String ⇒ ~~0000~~ 0011

$q_1 \xrightarrow{0} q_3 \xrightarrow{0} q_2 \xrightarrow{1} q_4 \xrightarrow{1} q_3 \xrightarrow{\wedge} q_3$

Output = 0100

Tute-3

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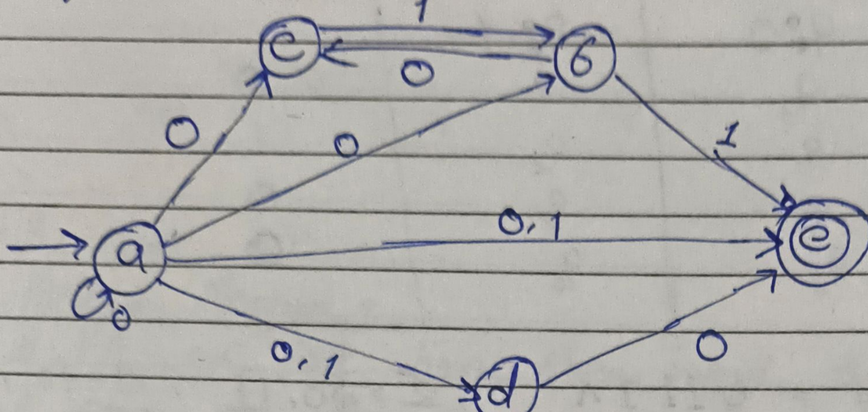
① Equivalent DFA for the NDFA



② Equivalent Mealy Machine for Moore Machine

Present State	Next state a=0	Next state a=1	Output
→ a	d	6	1
6	a	d	0
c	c	c	0
d	6	a	1

③ find equivalent Moore Machine for Mealy Machine

Present state	a=0 Next	a=0 O/P	a=1 Next	a=1 O/P
→ a	d	0	6	1
6	a	1	d	0
c	c	1	c	0
d	6	0	a	1

④ The one's compliment of an input bit string is a string that ha 1 wherever there was a 0, and a 0 wherever there was a 1; for example, the one's compliment of 001 is 110. Construct Mealy machine for one's compliment.

(5) Construct a nondeterministic finite automation accepting {ab, ba} and use it to find a deterministic automation accepting the same set.

Sol-1

NDFA =>

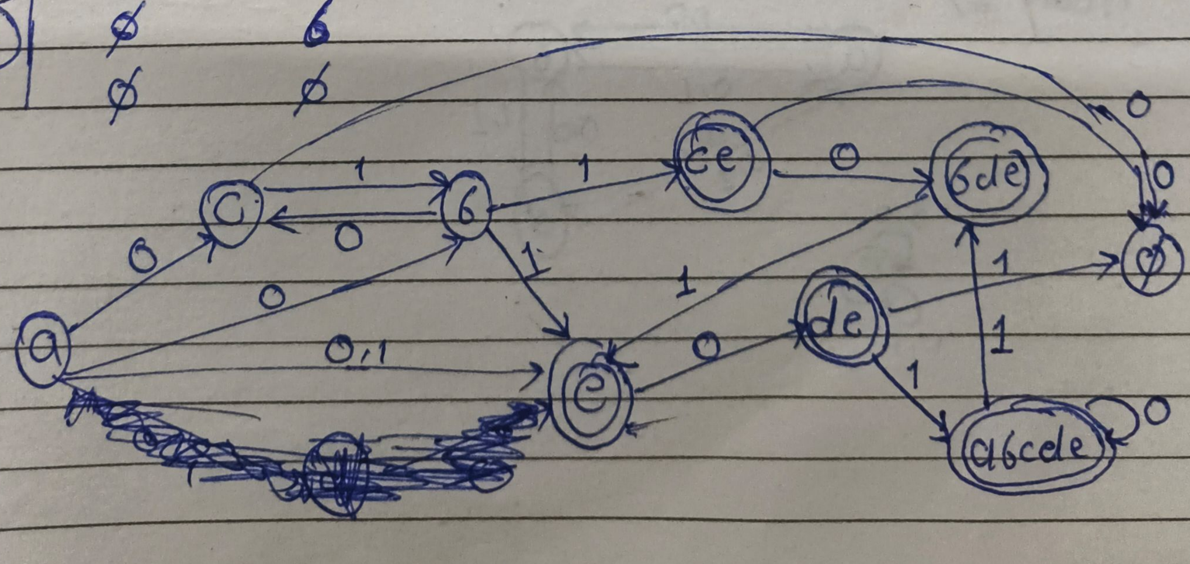
State	0	1
→ a	a,c,b,d,e	d,e
b	c	e
c	-	b
d	e	-
e	-	-

DFA =>

State	0	1
→ a	abcde	de
b	c	e
c	∅	b
~~d~~	~~e~~	~~∅~~
e	∅	∅
abcde	abcde	bde
de	e	∅
bde	ce	e
ce	∅	b
∅	∅	∅

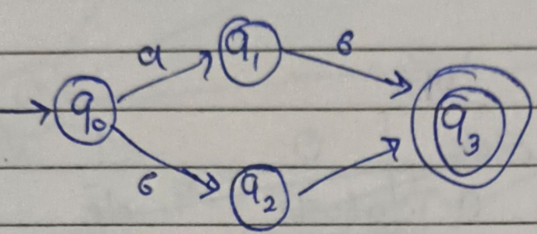
DFA

State	0	1
a	abcde	de
de	e	-
abcde	abcde	bde
bde	ce	e
ce	-	b
e	-	-
b	c	e
c	-	b
d	e	-

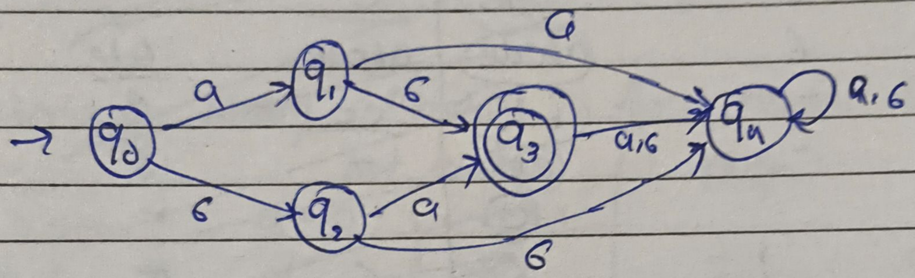


Q5 {ab, ba} → Construct NDF automation and use it to find DF for same set

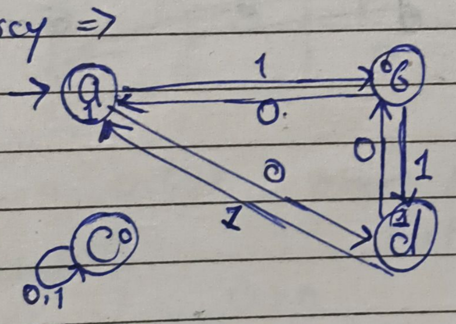
NDFA



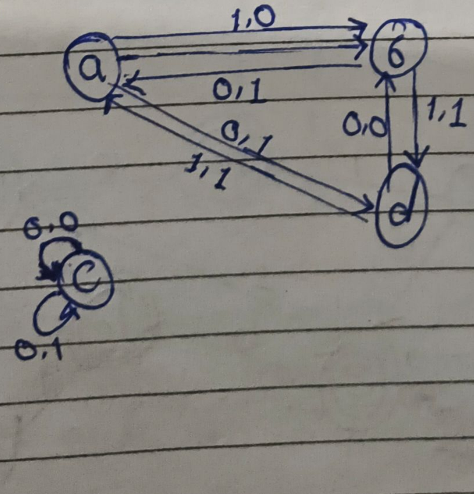
DFA



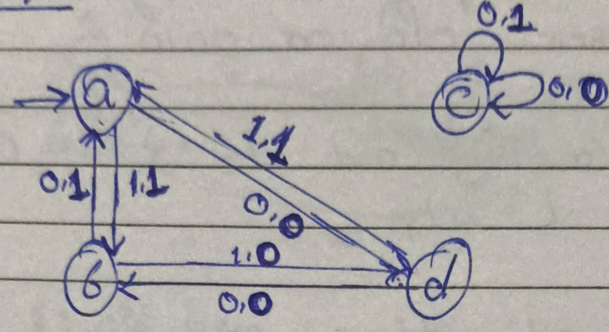
Q-2 Moorey ⇒



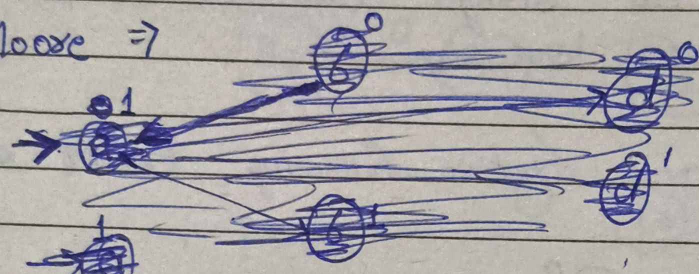
Mealy ⇒

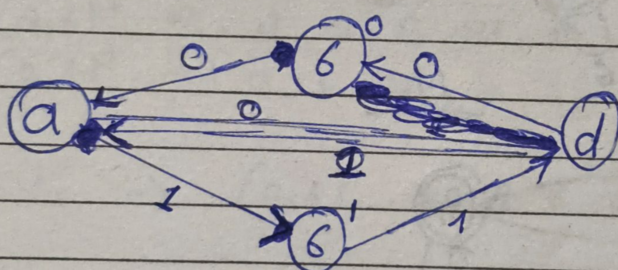


Q-3 Mealy =>



Moore =>





$(a, b)^* \Rightarrow \Lambda, a, b, aa, bb, ab, ba$

$(a, b)^+ \Rightarrow a, b, ab, ba$

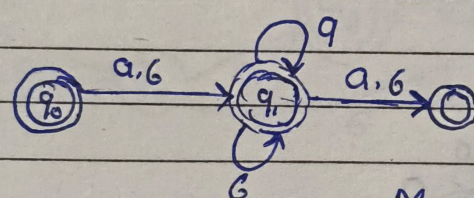
Tute-4

① Construct an FA accepting all strings over $\{0, 1\}$ ending with either 010 or 0010.

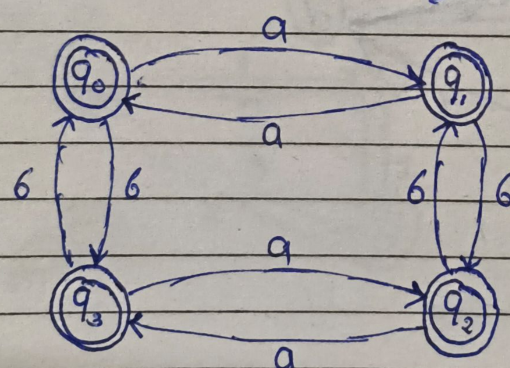
② If $L_1 = \{S1 \in (a, b)^*\}$ and $L_2 = \{S2 \in (a, b)^+\}$ draw FA for $L = L_1 L_2$

③ Draw FA for all strings over $\{0, 1\}$ consisting 010 or 111 as substring.

④ Prove or disprove whether following FA M_1 and M_2 are equivalent.

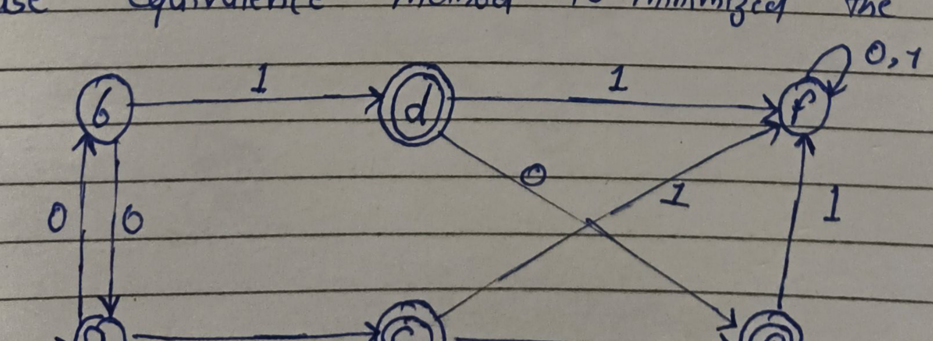


M_1



M_2

⑤ Use equivalence method to minimized the given FA.



a, b, ab, ba, aab, bbb

1010

00001

1 00 110010

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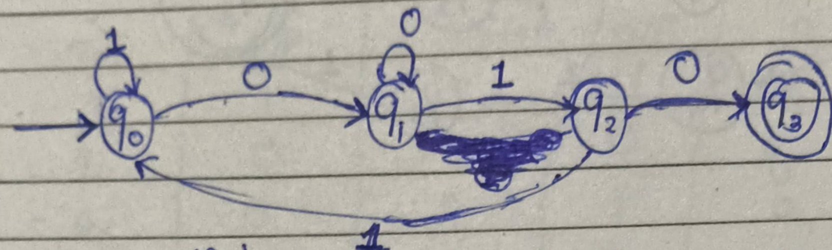
1011010

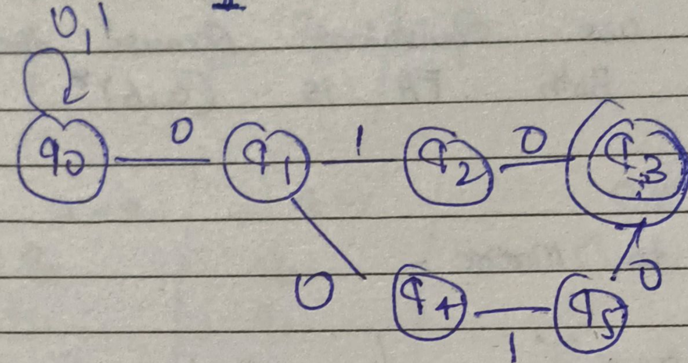
001110

$\boxed{\text{1010 and 0010}}$

Sol-1



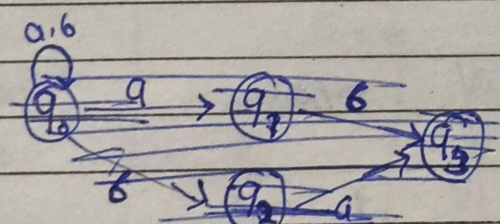
010010

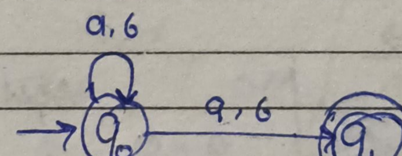


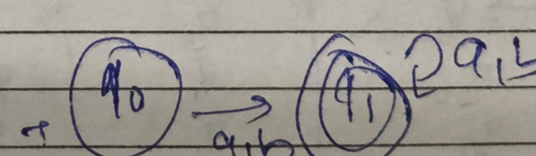
Sol-2 $L_1 = (a,b)^* \Rightarrow \Lambda, a, b, ab, ba - - - -$

$L_2 = (a,b)^+ \Rightarrow a, b, ab, ba - - - -$

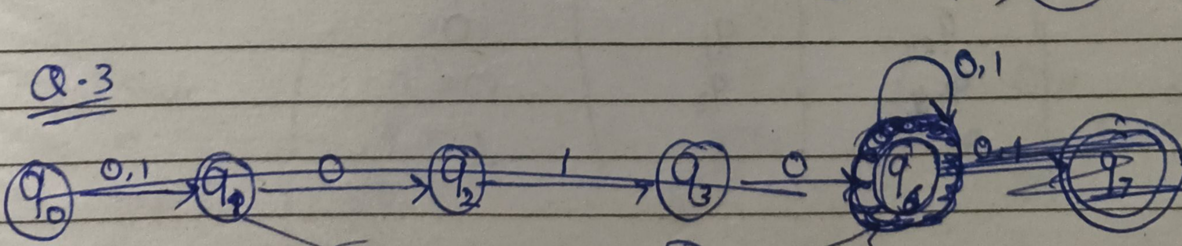
$L = L_1 L_2 \Rightarrow (a,b)^+ = a, b, ab, ba,$



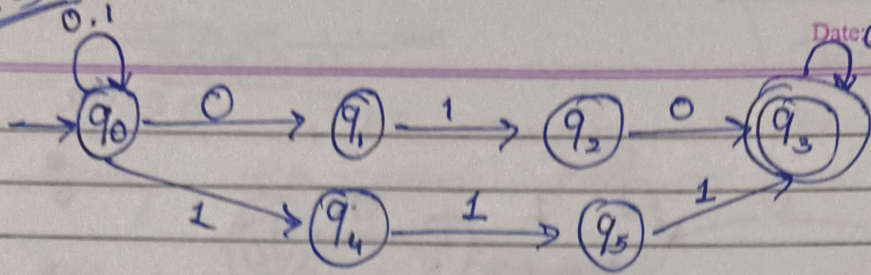




Q-3



Sol-3



Q-4 Both are equivalent because the language for Both FA is $(a, b)^*$

Melay to Moore -

Q Meley =>

	a=0 State	O/P	a=1 State	O/P
$\to q_1$	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

$q_1 \to 1$

$q_2 \to 0,1$

$q_3 \to 0$

$q_4 \to 0,1$

Moore =>

P State	Next a=0	Next a=1	O/P
$\to q_1$	q_3	q_{20}	1
q_{20}	q_1	q_{40}	0
q_{21}	q_1	q_{40}	1
q_3	q_{21}	q_1	0
q_{40}	q_{41}	q_3	0
q_{41}	q_{41}	q_3	1

Q Melay ⇒

Pstate	a=0 State	O/P	a=1 State	O/P
→ q_1	q_3	1	q_2	1
q_2	q_1	0	q_4	0
q_3	q_2	0	q_1	1
q_4	q_4	1	q_3	0

$q_1 \rightarrow 0, 1$
$q_2 \rightarrow 0, 1$
$q_3 \rightarrow 0, 1$
$q_4 \rightarrow 0, 1$

Moory ⇒

Pstate	a=0	a=1	O/P
p_{10}	q_{31}	q_{21}	0
p_{11}	q_{31}	q_{21}	1
p_{20}	q_{10}	q_{40}	0
p_{21}	q_{10}	q_{40}	1
p_{30}	q_{20}	q_{11}	0
p_{31}	q_{20}	q_{11}	1
p_{40}	q_{41}	q_{30}	0
p_{41}	q_{41}	q_{30}	1

Q

Pstate	a=0 State	O/P	a=1 State	O/P
→ q_1	q_2	Z_1	q_3	Z_1
q_2	q_2	Z_2	q_3	Z_1
q_3	q_2	Z_1	q_3	Z_2

$q_1 \rightarrow \phi$
$q_2 \rightarrow Z_1, Z_2$
$q_3 \rightarrow Z_1, Z_2$

Pstate	$a = Z_1$	$a = Z_2$	O/P
→ q_1	$q_2 Z_1$	$q_3 Z_1$	−, ∧, ϕ
$q_2 Z_1$	$q_2 Z_2$	$q_3 Z_1$	Z_1
$q_2 Z_2$	$q_2 Z_2$	$q_3 Z_1$	Z_2
$q_3 Z_1$	$q_2 Z_1$	$q_3 Z_2$	Z_1
$q_3 Z_2$	$q_2 Z_1$	$q_3 Z_2$	Z_2

Moory to Melay ⇒

P state	a = 0	a = 1	O/P
→ q_0	q_3	q_1	0
q_1	q_1	q_2	1
q_2	q_2	q_3	0
q_3	q_3	q_0	0

Melay ⇒

P State	a = 0		a = 1	
	State	O/P	State	O/P
→ q_0	q_3	0	q_1	1
q_1	q_1	1	q_2	0
q_2	q_2	0	q_3	0
q_3	q_3	0	q_0	0

Minimization of FA

1. Equivalance method
2. Table filling Method

1. Equivalance Method -

i) Two states Q_1 and Q_2 are said to be equivalent ~~to~~ ~~Q_2~~ if ~~both~~ ~~for~~ the input $\delta(Q_1, x)$ and $\delta(Q_2, x)$ are in the final state or both are in non final state.

ii) Two state Q_1 and Q_2 are said to be K equivalent $(K \geq 0)$ if both the states are in final state or are in non final state for all string of length K or less

Date: / / Page no:

* Steps of Minimization -
a) find π_0 (set of final and non final state)
b) find π_1 from π_0 (set of one - equivalent)
c) find π_{n+1} till $\pi_{n+1} = \pi_n$

Q

State	0	1
$\rightarrow q_0$	q_1	q_5
q_1	q_6	q_2
q_2	q_0	q_2
q_3	q_2	q_6
q_4	q_7	q_5
q_5	q_2	q_6
q_6	q_6	q_4
q_7	q_6	q_2

Sol

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

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

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

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

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

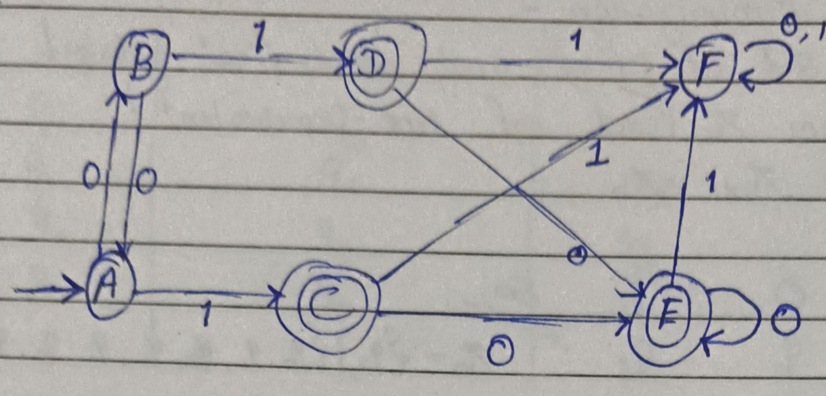
$\pi_2 = \pi_3$

State	0	1
$\rightarrow (q_0, q_4)$	$(q_1 q_7)$	$(q_3 q_5)$
(q_4, q_7)	q_6	q_2
q_2	$q_0 q_4$	q_2
$(q_3 q_5)$	-	-
(q_6)	-	-

Minimization using Table filling method.

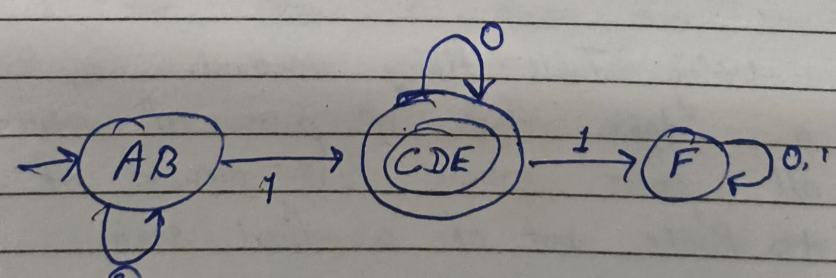
1. Draw a table for all pairs of states
2. Make all pairs where P is element of final table to P is not of a final state.
3. Repeate this step until no more marking can be made
4. Combine all the unmark pair and make them single state in the minimize FA.

Q



	A	B	C	D	E	F
A	x					
B		x				
C	✓	✓	x			
D	✓	✓		x		
E	✓	✓			x	
F	✓	✓	✓	✓	✓	x

* normal se final jane vala ho usi ko mark karna hai
* Ek normal and ek final state hona compulsury he



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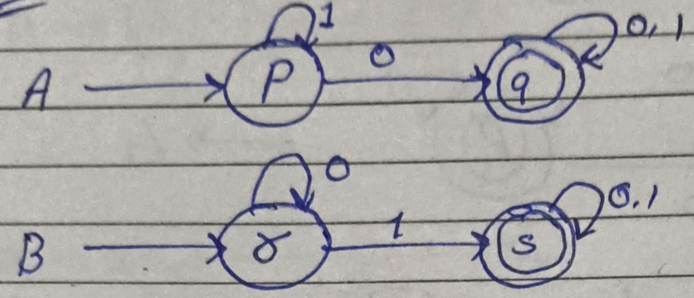
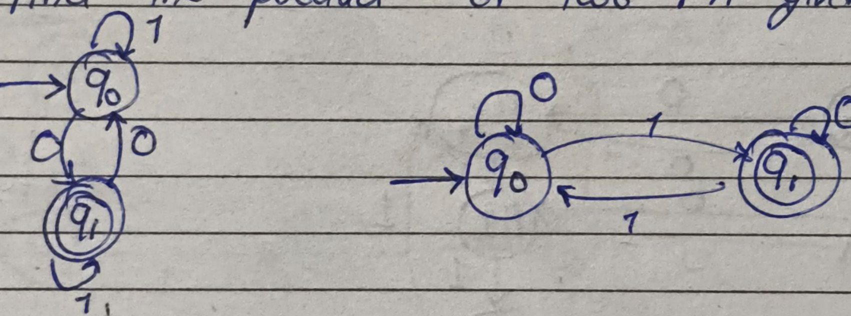
Tute-5

Q-1 Construct $A \cap B$ where A and B is given

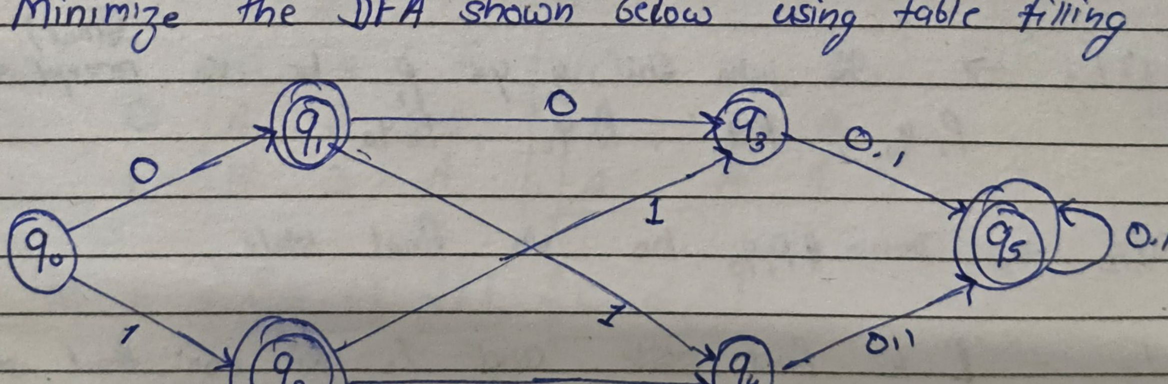


Q-2 $L1$ = {starts with a and ends with b} and $L2$ = {starts with b and ends with a}. Then find $L = L1 \cup L2$ or $L = L1 + L2$

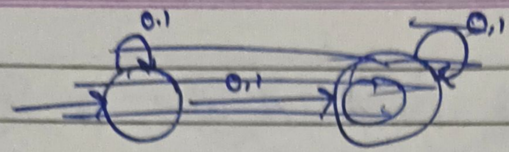
Q-3 find the product of two FA given below:



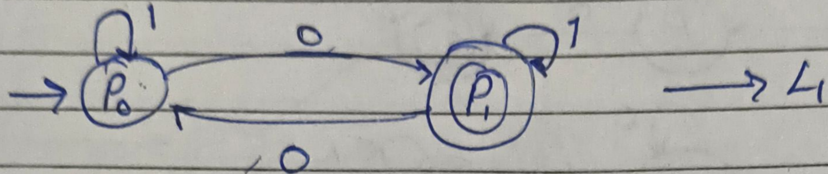
Q-4 Minimize the DFA shown below using table filling method:

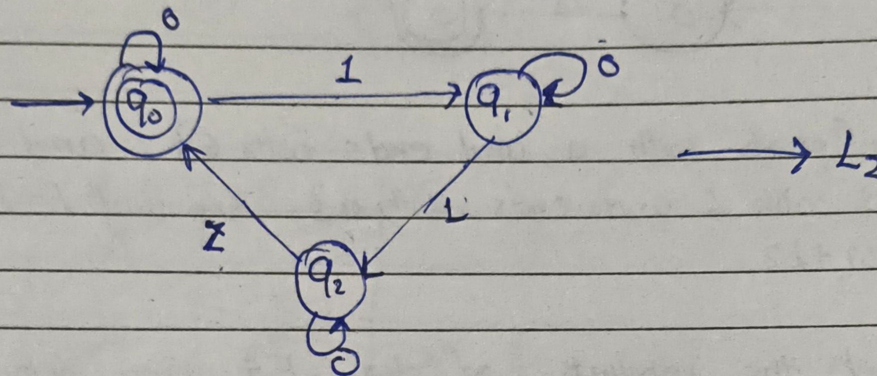


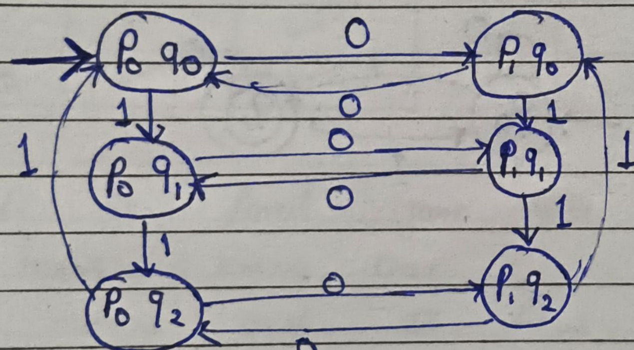
Sol-1



Eg







$L_1 \cup L_2$ → So jaha bhi q_0 ya P_1 he vo (final) accept state
$P_1 q_0$, $P_1 q_1$, $P_1 q_2$, $P_0 q_0$

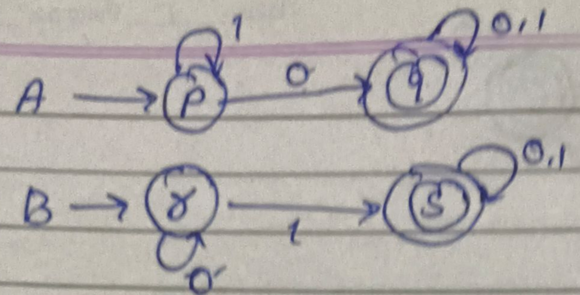
$L_1 \cap L_2$ → Dono $P_1 q_0$ ho vo final state

$L_1 - L_2$ - L_1 ki final state and L_2 ki non final state
$P_1 q_1$, $P_1 q_2$

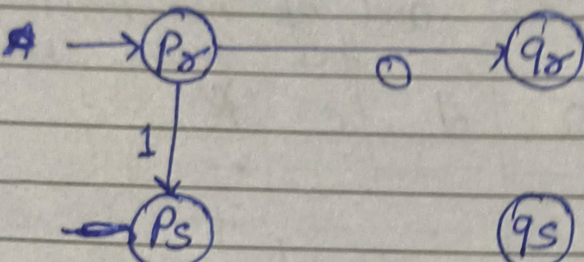
$L_2 - L_1$ = $P_0 q_0$, L_1 - final ko non final viseversa

L_1 , L_2 = L_1 ki saari final state se L_2 ki starting state jod do

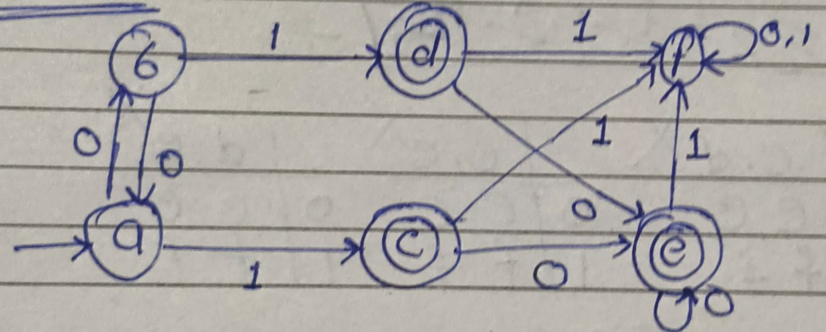
Sol-1



$A \cap B$



T-4 Q-5



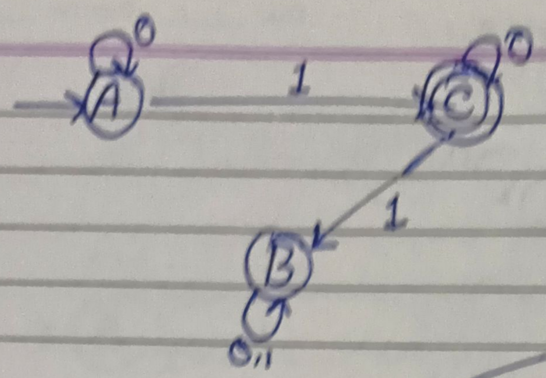
$\pi_0 = \{ \underbrace{\{a, b, f\}}_{A}, \underbrace{\{c, d, e\}}_{B} \}$

	a	b	f	c	d	e
0	A	A	A	B	B	B
1	B	B	A	A	A	A

$\pi_1 = \{ \underbrace{\{a, b\}}_{A} \underbrace{\{f\}}_{B} \underbrace{\{c, d, e\}}_{C} \}$

	a	b	f	c	d	e
0	A	A	B	C	C	C
1	B	B	B	B	B	B

$\pi_2 = \{ \{a, b\} \ \{f\} \ \{c, d, e\} \}$ $\boxed{\pi_1 = \pi_2}$



Iteration
① 1st ~~state~~ me ek final and ek non-final pe tick lagana hai

Now by table filling

	a	b	c	d	e	f
b	X					
c	✓1	✓1				
d	✓1	✓1	X			
e	✓1	✓1	X	X		
f	✓2	✓2	✓1	✓1	✓1	

2nd Iteration

	a, b
0	b a
1	c d

remain go to 3rd iteration

	c, d X
0	e e
1	f f

	c, e X
0	e e
1	f f

	d e X
0	e e
1	f f

	a, f ✓
0	b f
1	c f

	b f ✓
0	a f
1	d f

third

	a, b X
0	b a
1	c a

Unmarked = (a,b), (c,d) } cde
(c,e), (e,d) }

a,b

So bach gaya va akela