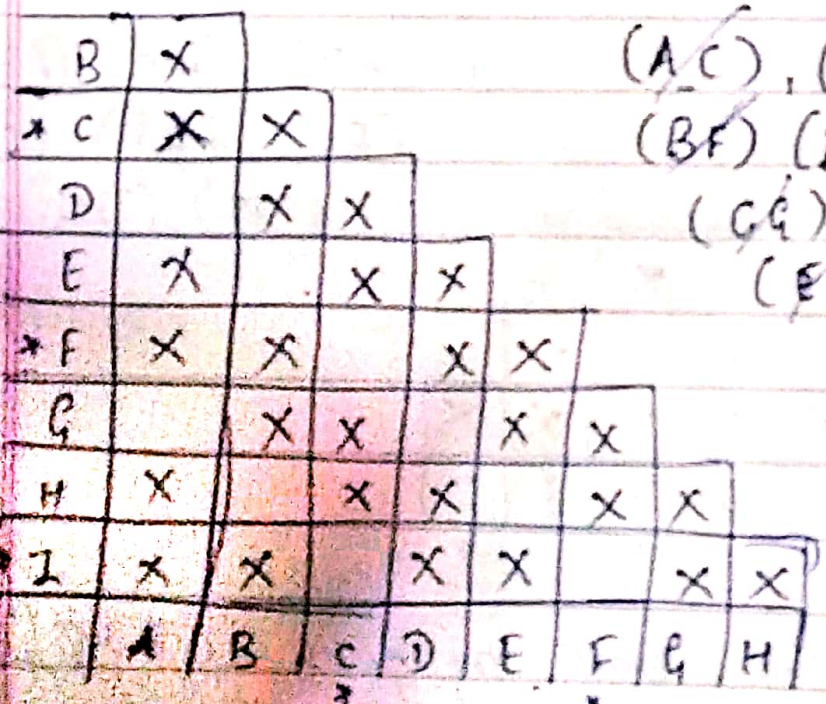
Tutorial practice

1] Minimize the DFA

δ	0	1
A	B	E
B	C	F
→ C	D	H
D	E	H
E	F	I
* F	G	B
G	H	B
H	I	C
* I	A	E



(AC), (AF) (AI) (BC)
(BF) (BI) (CD) (CE)
(CG) (CH) (DF) (DI)
(EF) (EI) (FG) (FH)
(GI) (HI)

δ	0	1
✗(A B)	(B C)	(E F)
✓(A D)	(B E)	(E H)
✗(A E)	(B F)	(E I)
✓(A G)	(B H)	(E B)
✗(A H)	(B I)	(E C)
✗(B D)	(C E)	(F H)
✓(B E)	(C F)	(F I)
✗(B G)	(C H)	(F B)
✓(B H)	(C I)	(F C)
✓(C F)	(D G)	(H B)
✓(C I)	(D A)	(H E)
✗(D E)	(E F)	(H I)
✓(D G)	(E H)	(H B)
✗(D H)	(E I)	(H C)
✗(E G)	(F H)	(I B)
✓(E H)	(F I)	(I C)
✓(F I)	(G A)	(B E)
✗(G H)	(H I)	(B C)

δ	0	1
(A D)	(B E)	(E H)
(A G)	(B H)	(E B)
(B E)	(C F)	(F I)
(B H)	(C I)	(F C)
(C F)	(D G)	(H B)
(C I)	(D A)	(H E)
(D G)	(E H)	(H B)
(E H)	(F I)	(I C)
(F I)	(G A)	(B E)

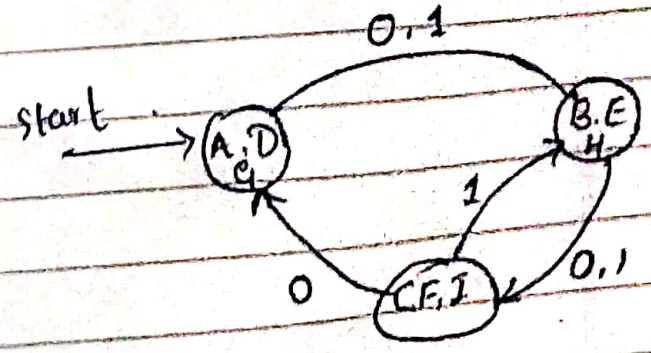
Pairs

(AD), (AG), (DG) ⇒ (A,D,G)

(BH), (BE), (EH) ⇒ (B,H,E)

(CF), (CI) (FI) ⇒ (C,F,I)

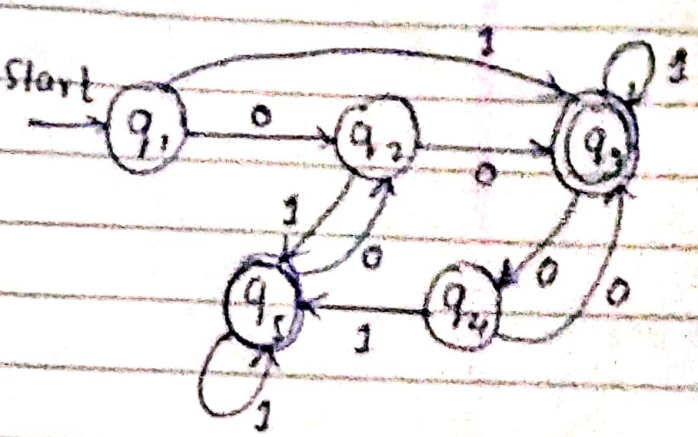
transition diagram



distinguishability

2] (b)

	δ	0	1
→	q_1	q_2	q_3
	q_2	q_3	q_5
*	q_3	q_4	q_3
	q_4	q_3	q_5
*	q_5	q_2	q_5

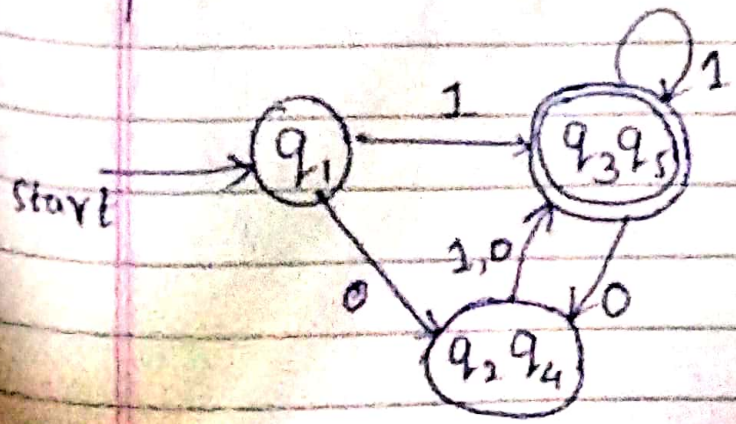


	q_2	×		
*	q_3	×	×	
	q_4	×		×
*	q_5	×	×		×
		q_1	q_2	q_3	q_4

$(q_1 q_3), (q_1 q_5)$
$(q_2 q_3), (q_2 q_5)$
$(q_3 q_4)$
$(q_4 q_5)$

δ	0	1
*$(q_1 q_2)$	$(q_2 q_3)$	$(q_3 q_5)$
*$(q_1 q_4)$	$(q_2 q_3)$	$(q_3 q_5)$
$(q_2 q_4)$	$(q_3 q_3)$	$(q_5 q_5)$
$(q_3 q_5)$	$(q_4 q_2)$	$(q_3 q_5)$

δ	0	1
$(q_2 q_4)$	$(q_3 q_5)$	$(q_5 q_3)$
* $(q_3 q_5)$	$(q_4 q_2)$	$(q_3 q_5)$
→ (q_1)	$(q_2 q_4)$	



2](a)

δ	0	1
$\rightarrow q_1$	q_2	q_3
q_2	q_3	q_5
$* q_3$	q_4	q_3
q_4	q_3	q_5
$* q_5$	q_2	q_5

$\rightarrow q_2$	X			
$* q_3$	X	X		
q_4	X		X	
$* q_5$	X	X	X	X
	q_1	q_2	q_3	q_4

$(q_1 q_2)$ $(q_1 q_4)$
$(q_2 q_4)$ $(q_3 q_5)$

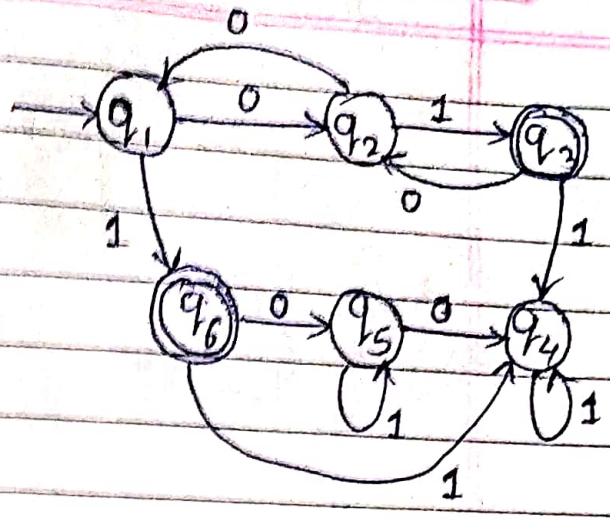
Hence the remaining pair $(q_2 q_4)$ are equivalants

	0	1	
q_2	q_3	q_5	$\rightarrow$ (F F) } Equivalants
q_4	q_3	q_5	$\rightarrow$ (F F) }

They reach the same destination
Hence equivalants

3)(b)

δ	0	1
→ q_1	q_2	q_6
q_2	q_1	q_3
* q_3	q_2	q_4
q_4	q_4	q_2
q_5	q_4	q_5
* q_6	q_5	q_4



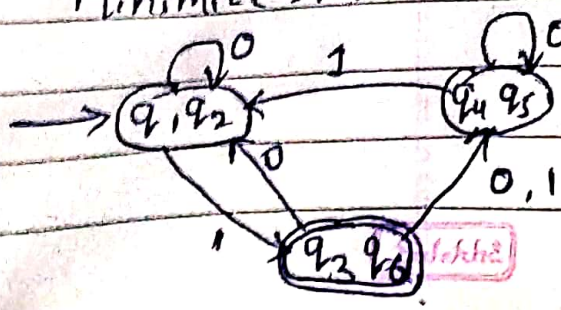
q_2					
* q_2	X	X			
q_4	X	X	X		
q_5	X	X	X		
* q_6	X	X		X	X
	q_1	q_2	q_3 *	q_4	q_5

$(q_1 q_3)$, $(q_1 q_6)$
$(q_2 q_3)$, $(q_2 q_6)$
$(q_3 q_4)$, $(q_3 q_5)$
$(q_4 q_6)$, $(q_5 q_6)$

δ	0	1
$(q_1 q_2)$	$(q_2 q_1)$	$(q_6 q_3)$
X $(q_1 q_4)$	$(q_2 q_4)$	$(q_6 q_2)$
X $(q_1 q_5)$	$(q_2 q_4)$	$(q_6 q_5)$
X $(q_2 q_4)$	$(q_1 q_4)$	$(q_3 q_2)$
X $(q_2 q_5)$	$(q_1 q_4)$	$(q_3 q_5)$
$(q_2 q_6)$	$(q_2 q_5)$	$(q_4 q_4)$
$(q_5 q_4)$	$(q_4 q_4)$	$(q_5 q_2)$

δ	0	1
$(q_1 q_2)$	$(q_1 q_2)$	$(q_3 q_6)$
$(q_3 q_6)$	$(q_1 q_2)(q_4 q_4)$	$(q_5 q_4)$
$(q_5 q_4)$	$(q_5 q_4)$	$(q_5 q_4)(q_1 q_2)$
~~$(q_4 q_5)$~~		

Minimize DFA is



3(a)

	δ	0	1
→	q_1	q_2	q_6
	q_2	q_1	q_3
*	q_3	q_2	q_4
	q_4	q_4	q_2
	q_5	q_4	q_5
*	q_6	q_5	q_4

	q_2	×			
*	q_3	×	×		
	q_4	×	×	×	
	q_5	×	×	×	×
*	q_6	×	×	×	×	×
		q_1	q_2	q_3	q_4	q_5

$(q_1 q_2)$ $(q_1 q_4)$ $(q_1 q_5)$ $(q_2 q_4)$ $(q_2 q_5)$
$(q_3 q_6)$ $(q_4 q_5)$

∴ There is no equivalants.