Sahana L
1BM18CS089

1. Minimize the following DFA using table filling algorithm whose A is the start state. The states C, F and I are the final states.

S	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

→ Stage 1: Cross the combinations of final and non-final states.

B	X							
C	X	X						
D		X	X					
E	X		X	X				
F	X	X		X	X			
G		X	X		X	X		
H	X		X	X		X	X	
I	X	X		X	X		X	X
	A	B	C	D	E	F	G	H

Boxes where combinations of final & ~~non~~ final, non-final and non-final are left open.

~~(A, G)~~ ~~(A,D)~~ ~~(A,E)~~

(A, C) (A,F) (A,I) (B, C) (B,F) (B,I) (C,D)

(C,E) (C,G) (C, H) (D,F) (D,I) (E,F) (E,I)

(F, G) (F, H) (G,I) (H, I)

Stage 2 :

S	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)~~	~~(E,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,G)~~ ~~(D,E)~~	~~D~~ ~~(E,F)~~	~~(H,I)~~
(D,G)	~~D~~, (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)~~

Scanned by CamScanner

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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)

Indistinguishable pairs

(A, D) (A, G) (D, G) ⇒ (A, D, G)

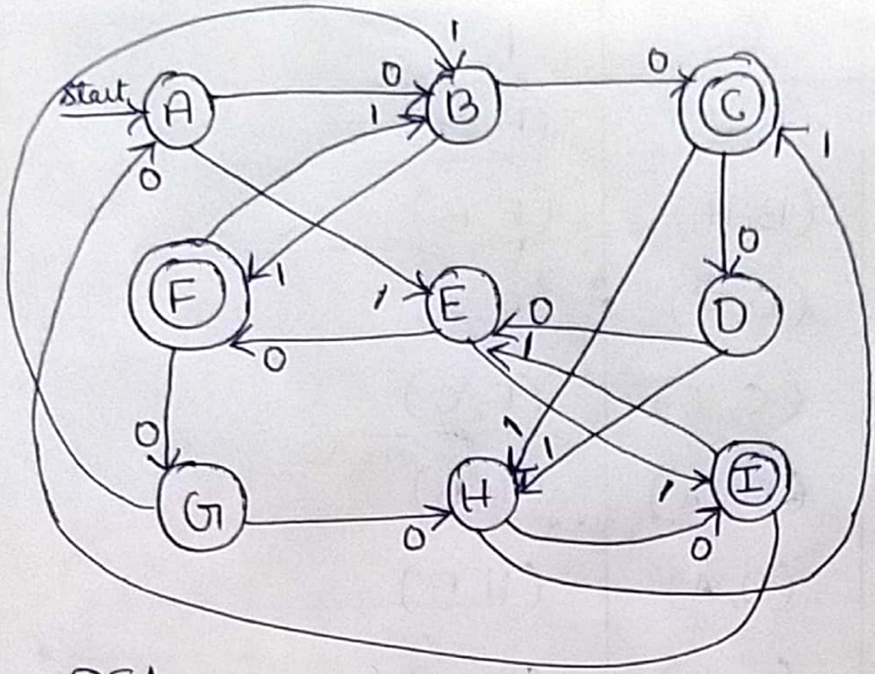
(B, H) (B, E) (E, H) ⇒ (B, H, E)

(C, F) (C, I) (F, I) ⇒ (C, F, I)

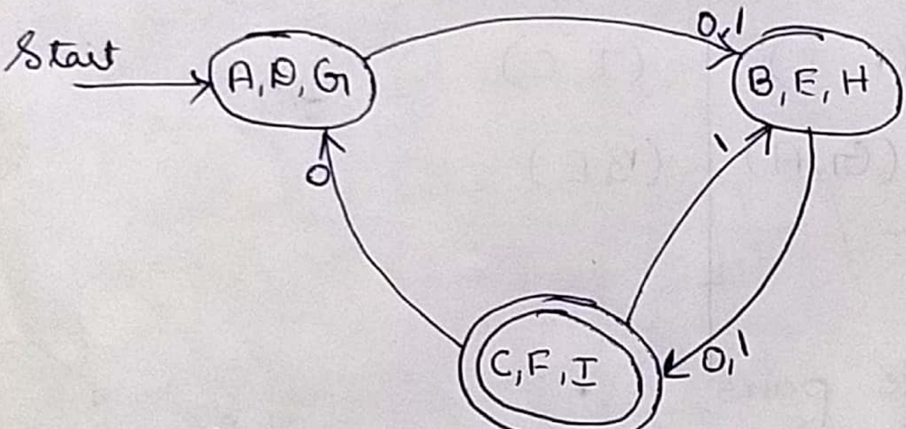
Transition table

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

Initial DFA



Final DFA



Transition diagram

sider the DFA given by the transition table

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	$*q_5$

a) Draw the table of distinguishabilities for this automation

b) Construct the minimum state equivalent DFA

→ Step 1:

a)

q_2	X			
q_3	X	X		
q_4	X		X	
q_5	X	X		X
	q_1	q_2	q_3	q_4

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

Step 2:

δ	0	1
$\cancel{(q_1, q_2)}$	$\cancel{(q_2, q_3)}$	$\cancel{(q_3, q_5)}$
$\cancel{(q_1, q_4)}$	$\cancel{(q_2, q_3)}$	$\cancel{(q_3, q_5)}$
(q_2, q_4)	(q_3, q_3)	(q_5, q_5)
(q_3, q_5)	(q_4, q_2)	(q_3, q_5)

Step 3:

δ	0	1
(q_2, q_4)	q_3	q_5
(q_3, q_5)	(q_4, q_2)	(q_3, q_5)

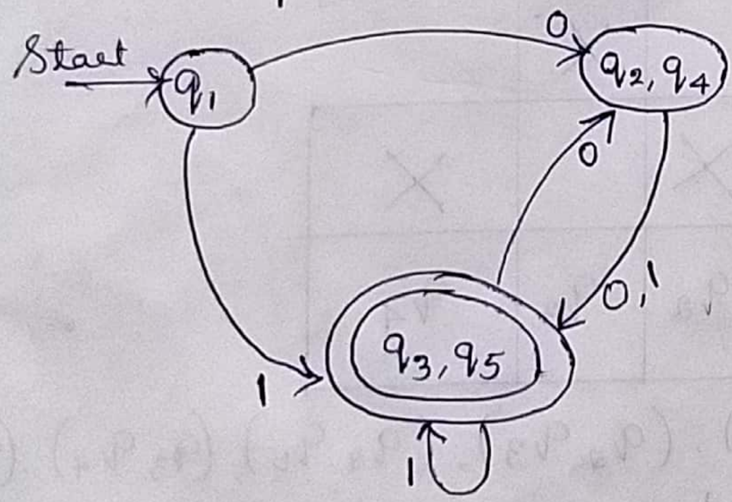
Indistinguishable states are (q_2, q_4) and (q_3, q_5)

δ	0	1
(q_2, q_4)	(q_3, q_5)	(q_3, q_5)
$\star (q_3, q_5)$	(q_2, q_4)	(q_3, q_5)

Transition table

δ	0	1
$\rightarrow q_1$	(q_2, q_4)	(q_3, q_5)
(q_2, q_4)	(q_3, q_5)	(q_3, q_5)
$\star (q_3, q_5)$	(q_2, q_4)	(q_3, q_5)

b.)



nsider the DFA given by the transition table

δ	0	1
$\rightarrow q_1$	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

a) Draw the table of distinguishabilities for this automation

b) Construct the minimum state equivalent DFA

Step 1:

a)

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

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

Step 2

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

/*

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

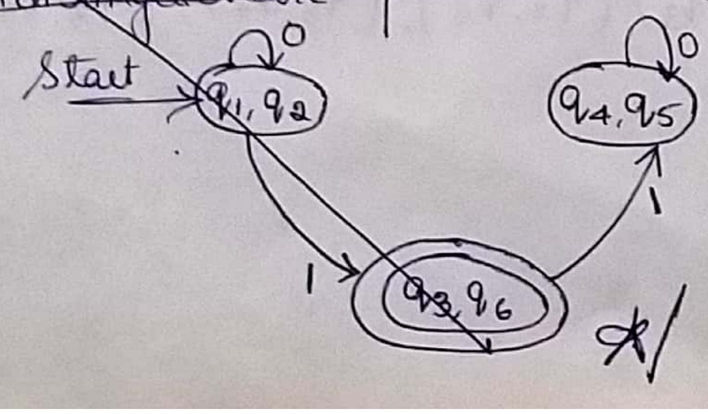
*/

~~Transition table~~

δ	0	1
→ ~~(q_1, q_2)~~	~~(q_2, q_1)~~	~~(q_6, q_3)~~
* ~~(q_3, q_6)~~	~~(q_2, q_5)~~	~~(q_4, q_5)~~
~~(q_4, q_5)~~	~~(q_4, q_5)~~	~~(q_2, q_5)~~

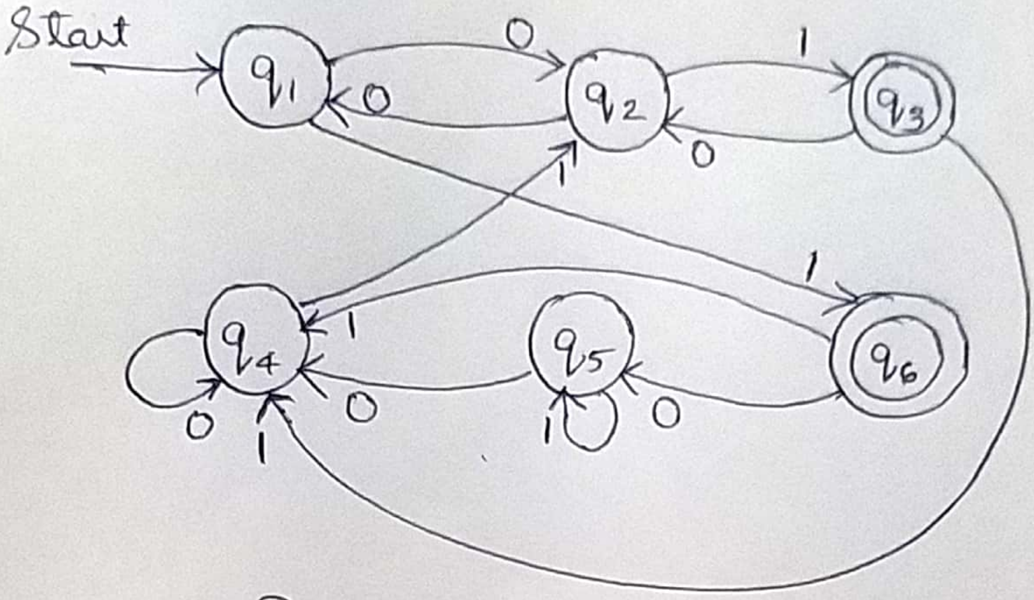
There are no indistinguishable pairs.

/* ~~Indistinguishable pairs are~~ ~~(q_1, q_2)~~, ~~(q_4, q_5)~~, ~~(q_3, q_6)~~



*/

Transition diagram.



DFA