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(1) Minimize the following DFA using table filling Algorithm where A is start state. The states C, F and I are Final states.

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

Table filling algorithm.

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

Step1: Cross the combination of Final and Non-final states
(A, C) (A, F) (A, I) (B, C) (B, F) (B, I) (C, H) (C, G) (C, D) (C, E)
(D, I) (D, F) (E, I) (E, F) (F, G) (F, H) (G, I) (H, I)
cannot Be Equivalent states.

Boxes where combinations of Final and non-final are left open.

Step 2:

Check the 0 i/p and 1 i/p combinations of A and B to start with.

S	0	1
X (A,B)	(B,C)	(E,F)
(A,D)	(B,E)	(E,H)
X (A,E)	(B,F)	(E,I)
(A,G)	(B,H)	(E,B)
X (A,H)	(B,I)	(E,G)
(B,H)	(C,I)	(F,C)
X (B,G)	(C,H)	(F,B)
X (B,D)	(C,E)	(I,H)
(B,E)	(C,F)	(F,I)
(C,F)	(D,G)	(H,B)
(C,I)	(D,A)	(H,E)
X (D,H)	(E,I)	(H,C)
(D,G)	(E,H)	(H,B)
X (E,G)	(F,H)	(I,B)
(E,H)	(F,I)	(I,C)
(F,I)	(G,A)	(B,F)
X (G,H)	(H,I)	(B,C)

Table;

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

Hence the remaining pairs are Equivalent.

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

From the above table.

$A = D$ & $D = G$ & $A = G$

$A = D = G$

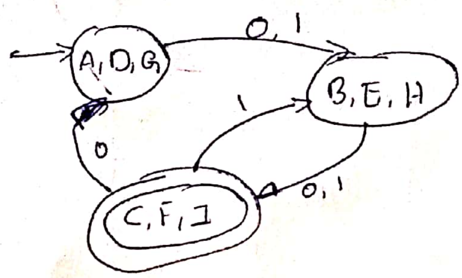
$B = E$ & $F \neq H$ & $B = H$

$B = F = H$

$\Rightarrow C = I = F$

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

Transition diagram of minimised DFA.



Problem 2:

Consider the DFA given by Transition:

δ	0	1
→ r_1	r_2	r_3
r_2	r_3	r_5
* r_3	r_4	r_3
r_4	r_3	r_5
* r_5	r_2	r_5

ⓐ Draw the table of distinguishabilities for this automation

ⓑ Construct the min. State equivalent DFA

Table filling algorithm.

r_2				
r_3	X	X		
r_4			X	
r_5	X	X		X
	r_1	r_2	r_3	r_4

Step 1: cross the combinations of Final and Non-Final states:

(r_1, r_5) (r_1, r_3) (r_2, r_5) (r_2, r_3) (r_3, r_4) (r_4, r_5) cannot be equivalent states.

Boxes whose combinations of final and non-final state are left open.

Step 2: Check O/P and I/P combination of A & B to start with.

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)

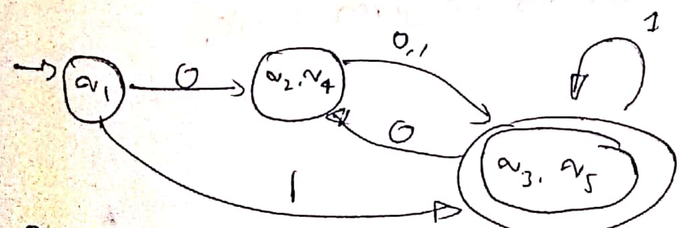
q_2	×			
q_3	×	×		
q_4	×		×	
q_5	×	×		×
	q_1	q_2	q_3	q_4

Step 3:

∴ only (q_2, q_4) and (q_3, q_5) form the equivalent for given transition.

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

Reduced D.F.A



Problem 3: Repeat Exercise 4.4.1 for the DFA

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

Table Filling algorithm,

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

Step 1 : cross the combination of Final and non-Final States .

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

cannot be equivalents .

Step 2:

S	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) X
(q_3, q_6)	(q_2, q_5)	(q_4, q_4) X
(q_4, q_5)	(q_4, q_4)	(q_2, q_5) X

After Step 2 and Step 3 we can say there are no Equivalent States for the given table.