Reduction of state table

- This step is used to reduce the number of states in state table
- Reducing the number of steps in a state table will
  - Reduce the amount of input gates, and
  - The number of Flip-Flops may also be reduced

Minimization Procedure

- Step #1 : Elimination of redundant states by applying
  - Row matching technique
- Step #2 : Elimination of equivalent states by applying
  - Partitioning method
  - Implication table method

Reduction of state table

- **Equivalent States**

  Two states p and q of a sequential circuit are equivalent iff for every single input X, the outputs are the same and the next states are equivalent.

- **Equivalent Networks**

  The sequential network $\mathbf{N_1}$ is equivalent to sequential network $\mathbf{N_2}$ if for each state p in $\mathbf{N_1}$ there is a state q in $\mathbf{N_2}$ such that $p \equiv q$, and conversely, for each state s in $\mathbf{N_2}$ there is a state t in $\mathbf{N_1}$ such that $s \equiv t$

Reduction of state table

- **Example : 1**

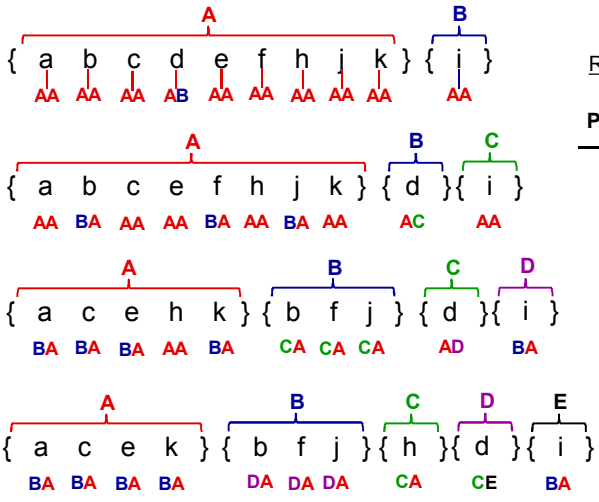
For the following state table, find the corresponding reduced one

Step #1 : Row Matching

P.S.	N.S. X = 0	N.S. X = 1	Output X = 0	Output X = 1	
a	b	c	0	0	
b	d	e	0	0	
c	f	g e	0	0	
d	h	i	0	0	
e	j	k	0	0	
f	d	l k	0	0	
Remove g — g	j	l k	0	0	g and e are the same
h	h	a	0	0	
i	j	a	1	0	
j	d	a	0	0	
k	b	a	0	0	l and k are the same
Remove l — l	b	a	0	0	

Reduction of state table

Step # 2 : Partitioning method



Reduced state table

P.S.	N.S. X = 0	N.S. X = 1	Output X = 0	Output X = 1
A a	B b	A c	0	0
B b	D d	A e	0	0
C c	C f	A e	0	0
D d	C h	E i	0	0
E e	B j	A k	1	0
f	d	k	0	0
h	h	a	0	0
i	j	a	1	0
j	d	a	0	0
k	b	a	0	0

Reduction of state table

- **Example : 2**

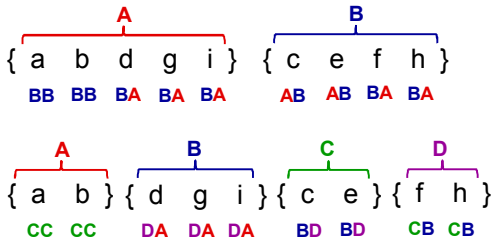
  For the following state table, find the corresponding reduced one.

Step #1 : No Row Matching

P.S.	N.S. X = 0	N.S. X = 1	Output Z
a	e	e	1
b	c	e	1
c	i	h	0
d	h	a	1
e	i	f	0
f	e	g	0
g	h	b	1
h	c	d	0
i	f	b	1

Reduction of state table

Step # 2 : Partitioning method



Reduced state table

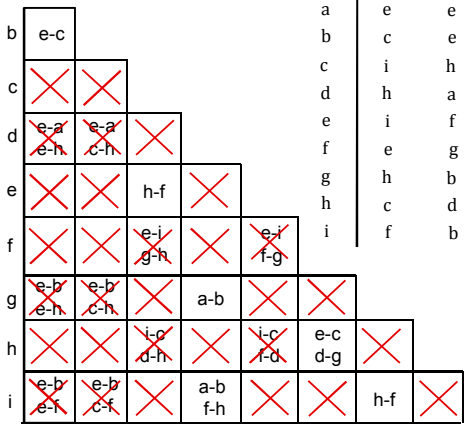
P.S.	N.S. X = 0	N.S. X = 1	Z
A	C	C	1
B	D	A	1
C	B	D	0
D	C	B	0

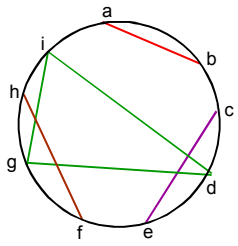
P.S.	N.S. X = 0	N.S. X = 1	Output Z
a	e	e	1
b	c	e	1
c	i	h	0
d	h	a	1
e	i	f	0
f	e	g	0
g	h	b	1
h	c	d	0
i	f	b	1

Reduction of state table

Step # 2 : Implication Table method

P.S.	N.S. X = 0	N.S. X = 1	Z
a	e	e	1
b	c	e	1
c	i	h	0
d	h	a	1
e	i	f	0
f	e	g	0
g	h	b	1
h	c	d	0
i	f	b	1





Equivalent Classes

{a , b} {d , g , i} {c , e} {h , f}

Reduced state table

P.S.	N.S. X = 0	N.S. X = 1	Z
A	C	C	1
B	D	A	1
C	B	D	0
D	C	B	0

Reduction of state table

- **Example : 3**

For the following state table, find the corresponding reduced one

Step #1 : No Row Matching

Step # 2 : Partitioning method

A { a g h } AC AC AC

B { b e } CC CC

C { c d f } AB CA CA

A { a g h } AC AC AC

B { b e } CC CC

C { c } AB

D { d f } DA DA

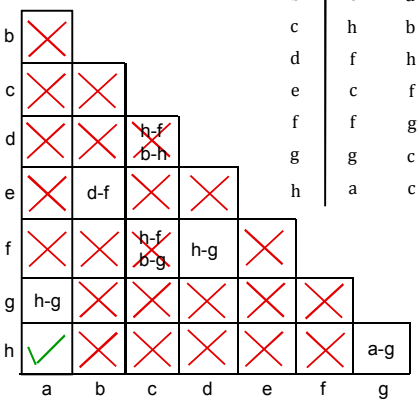
Reduced state table

P.S.	N.S. X = 0	N.S. X = 1	Z X = 0	Z X = 1
A	A	C	1	0
B	C	C	0	1
C	A	B	0	0
D	D	A	0	0

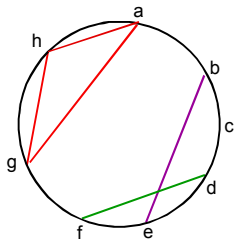
P.S.	N.S. X = 0	N.S. X = 1	Z X = 0	Z X = 1
a	h	c	1	0
b	c	d	0	1
c	h	b	0	0
d	f	h	0	0
e	c	f	0	1
f	f	g	0	0
g	g	c	1	0
h	a	c	1	0

Reduction of state table

Step # 2 : Implication Table method



P.S.	N.S. X = 0	N.S. X = 1	Z X = 0	Z X = 1
a	h	c	1	0
b	c	d	0	1
c	h	b	0	0
d	f	h	0	0
e	c	f	0	1
f	f	g	0	0
g	g	c	1	0
h	a	c	1	0



Equivalent Classes

{a , g , h} {b , e} { c } {d , f}

Reduced state table

P.S.	N.S. X = 0	N.S. X = 1	Z X = 0	Z X = 1
A	A	C	1	0
B	C	C	0	1
C	A	B	0	0
D	D	A	0	0