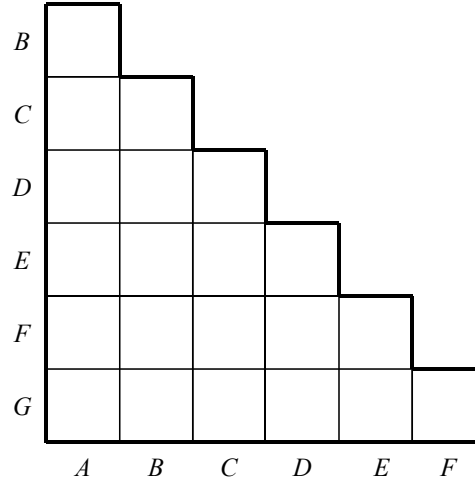


CSIE 2344: Discussion (Unit 15)

1 Reduction of State Table

One state table is as below.

	Next State		Z	
	$X=0$	$X=1$	$X=0$	$X=1$
A	E	G	0	1
B	D	F	0	1
C	E	C	1	0
D	B	F	0	1
E	G	F	0	1
F	B	D	1	0
G	E	C	1	0



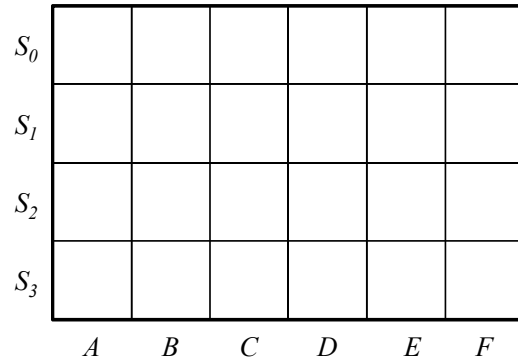
1. Reduce the table to a minimum number of states.
2. Using the basic definition of state equivalence, show that state A is not equivalent to state B .

2 Circuit Equivalence

Two circuits have the state tables as below.

	Next State		Z
	$X=0$	$X=1$	
S_0	S_3	S_1	0
S_1	S_0	S_1	0
S_2	S_0	S_2	1
S_3	S_0	S_3	1

	Next State		Z
	$X=0$	$X=1$	
A	E	A	1
B	F	B	1
C	E	D	0
D	E	C	0
E	B	D	0
F	B	C	0



1. Without reducing the tables, determine whether they are equivalent.
2. Reduce each table to a minimum number of states, and then show that they are equivalent.

3 State Graph Derivation of State Elimination (No Recording)

1. Draw the state graph of a Mealy machine which detects if the number of 1's in k inputs is equal to or more than m , where $0 \leq m \leq k$ and $1 \leq k$. Requirements:

- Reset the machine after k inputs.
- After a reset, always output “0” for the following $k - 1$ inputs.
- After a reset, for the k -th input, output “1” if the number of 1's (in the k inputs after the reset) is equal to or more than m .
- After a reset, for the k -th input, output “0” if the number of 1's (in the k inputs after the reset) is fewer than m .
- Example with $(m, k) = (2, 3)$:

Input 000 001 100 110 011 111
Output 000 000 000 001 001 001

- Try to reduce the number of states (eliminate redundant states).
 - Explain why the Mealy machine works.
 - Answer the number of states (it should depend on m and k) and explain the answer.
2. Draw the state graph of a Mealy machine which does not reset after k inputs (conceptually, a window with size k shifts along with the inputs). Requirements:

- After the initialization, always output “0” for the first $k - 1$ inputs.
- Starting from the k -th input, output “1” if the number of 1's (in the previous k inputs including the current input) is equal to or more than m .
- Starting from the k -th input, output “0” if the number of 1's (in the previous k inputs including the current input) is fewer than m .
- Example with $(m, k) = (2, 3)$:

Input 000 001 100 110 011 111
Output 000 000 110 011 001 111

- Try to reduce the number of states (eliminate redundant states).
- Explain why the Mealy machine works.
- Answer the number of states (it should depend on m and/or k) and explain the answer.