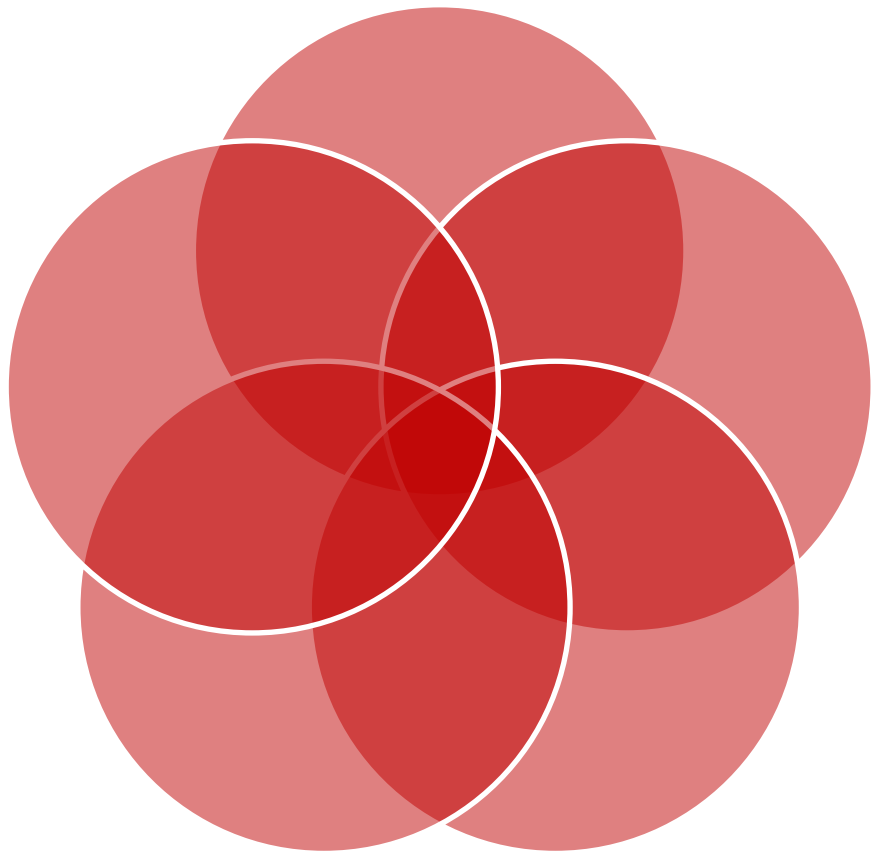
DIGITAL LOGIC
数字逻辑

01 Course Content

Course Content

Mealy Vs Moore machines

Excitation Realization Cost



State Machine Notation

Excitation Table and Equations

State Diagram

Finite State Machines

A state machine is a sequential circuit having a **limited (finite) number** of states occurring in a prescribed order. Two basic types of state machines are the **Moore** and the **Mealy**. The Moore state machine is one where <u>the outputs depend only on the internal present state</u>. The Mealy state machine is one where <u>the outputs depend on both the internal present state and on the inputs</u>. Both types have a timing input (clock) that is not considered a controlling input. A design approach to counters is presented in this section.

Mealy Vs Moore machines

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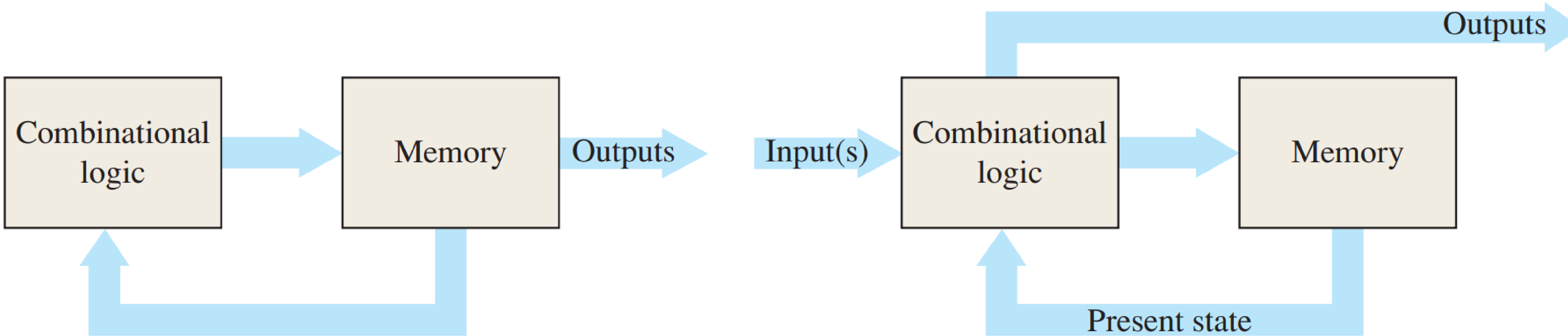
- Mealy model:
  - Both outputs and next state depend both on primary inputs AND present state.
- Moore model:
  - Only next state depends directly on primary inputs AND present state. Outputs depend only on present state.

General Models of Finite State Machines



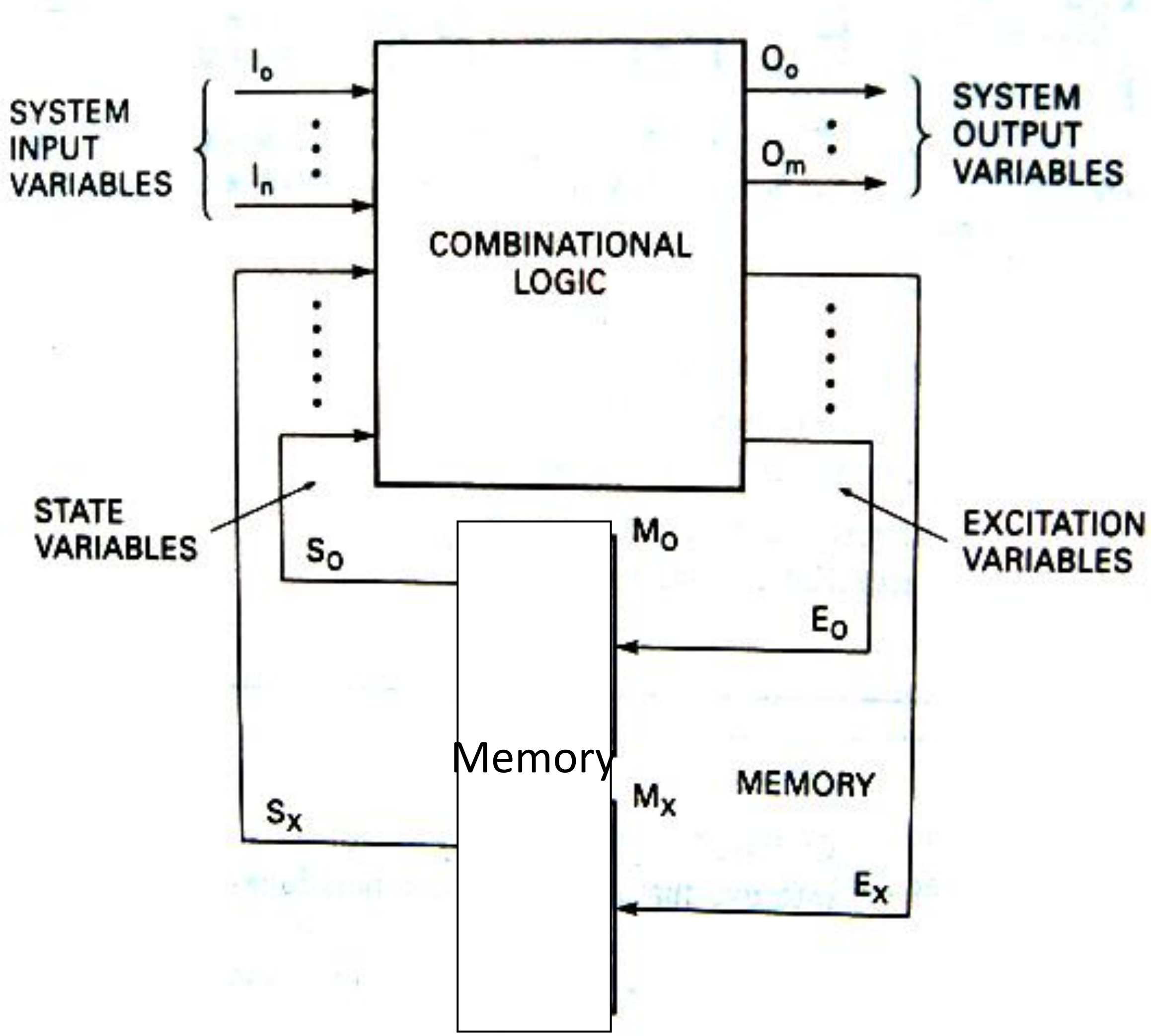
(a) Moore machine (b) Mealy machine

Two types of sequential logic.

General Models of Finite State Machines

In the Moore machine, the combinational logic is a **gate array** with outputs that determine the next state of the flip-flops in the memory. There may or may not be inputs to the combinational logic. There may also be output combinational logic, such as a decoder. If there is an input(s), it does not affect the outputs because they always correspond to and are dependent only on the present state of the memory. For the Mealy machine, the present state affects the outputs, just as in the Moore machine; but in addition, the inputs also affect the outputs. The outputs come directly from the combinational logic and not the memory.

State Machine Notation



- ✓Input variable
- ✓Output variable
- ✓State variable
- ✓Excitation variable
- ✓State

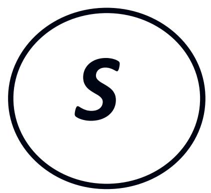
State variables and states are related by the expression:

$$2^x = y$$

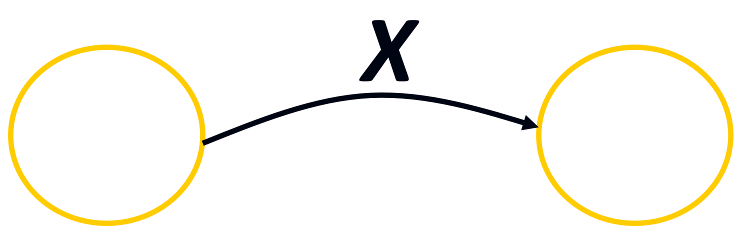
State variables   states

State Diagram

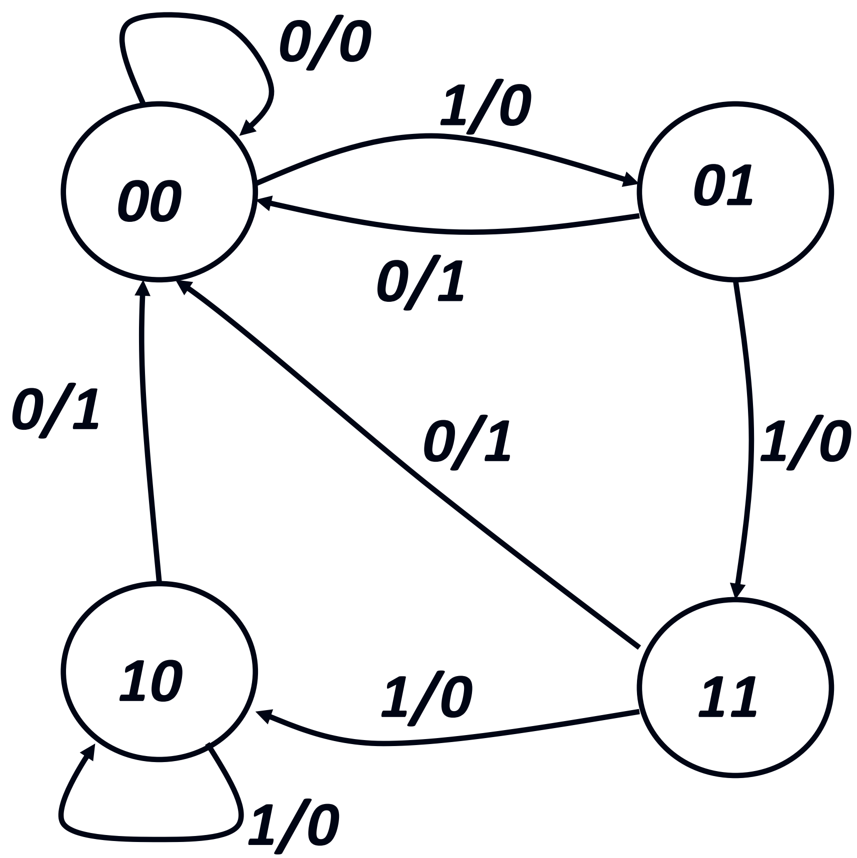
- Graphical representation of a state table.
- Graph ***node*** with label ***s*** denotes state ***s***

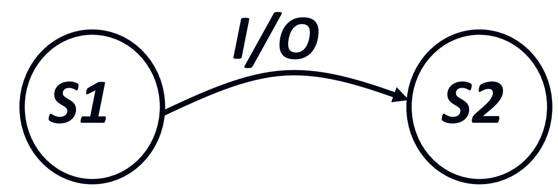


- Graph ***edge*** with label ***X*** denotes transition between two states when input ***X*** is applied



State Diagram of Mealy model





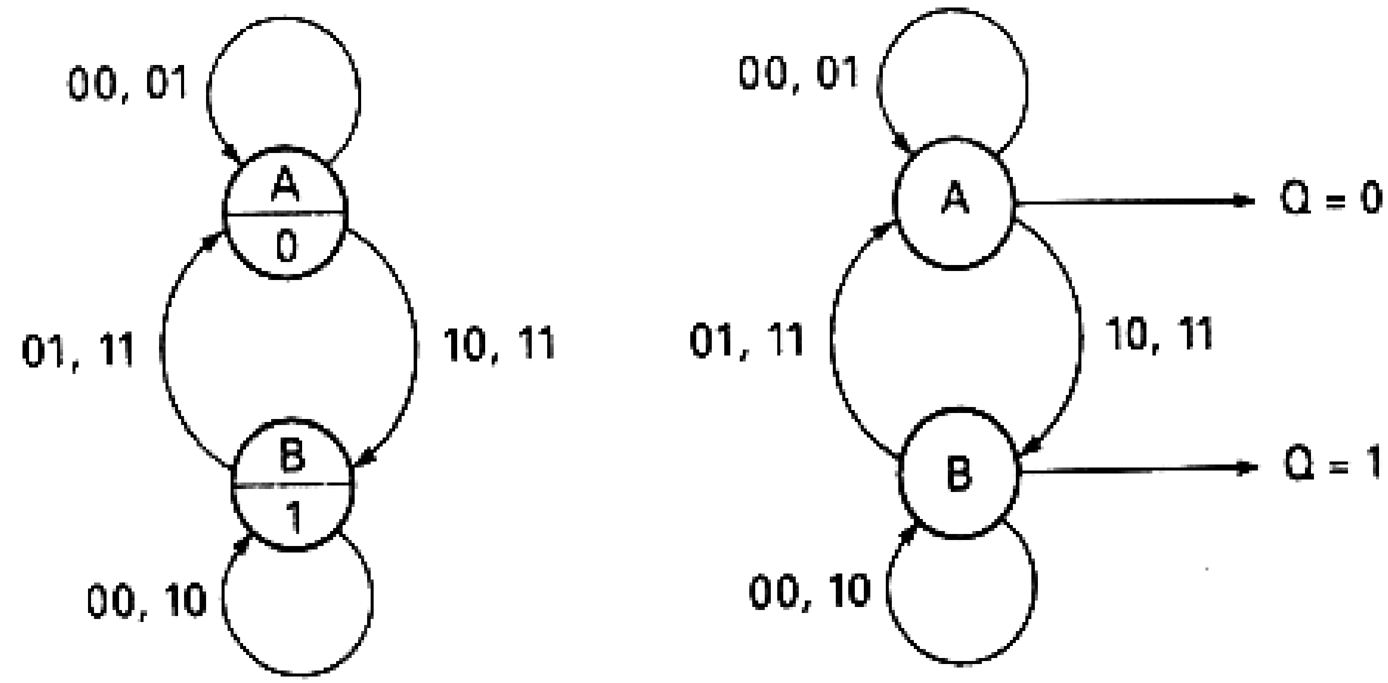
Reads as:

When at state ***s1*** and apply input ***I***, we get output ***O*** and proceed to state ***s2.***

State Diagram

J	K	Next State of Q
0	0	Q
0	1	0
1	0	1
1	1	$\overline{Q}$

Figure 6.5
Moore circuit notation of a *J–K* flip-flop

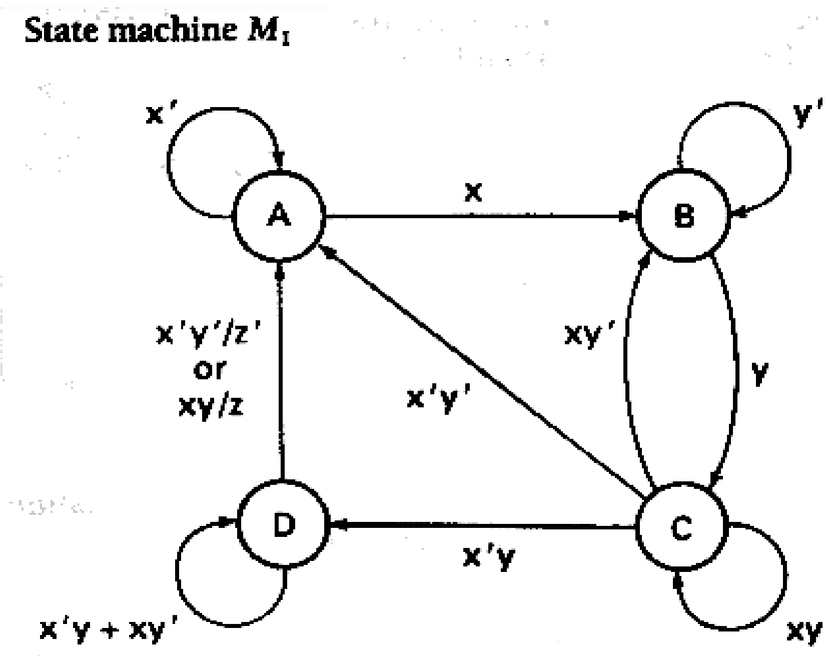


(a) Output Variables Written under State Variable Names

(b) Output Variables Indicated by Arcs

State Table

- Enumerates the relationship between inputs, outputs, and states of the sequential circuit.



Present state	Next state xy/z							
	00	z	01	z	11	z	10	z
A	A	0	A	0	B	0	B	0
B	B	0	C	0	C	0	B	0
C	A	0	D	0	C	0	B	0
D	A	0	D	0	A	1	D	0

State Table

Present state	Next state xy/z 00	z	01	z	11	z	10	z
A	A	0	A	0	B	0	B	0
B	B	0	C	0	C	0	B	0
C	A	0	D	0	C	0	B	0
D	A	0	D	0	A	1	D	0

State Table

Present State	Input X	Y	Next State	Output Z
A	0	0	A	0
A	0	1	A	0
A	1	0	B	0
A	1	1	B	0
B	0	0	B	0
B	0	1	C	0
B	1	0	B	0
B	1	1	C	0
D	0	0	A	0
D	0	1	D	0
D	1	0	D	0
D	1	1	A	1
C	0	0	A	0
C	0	1	D	0
C	1	0	B	0
C	1	1	C	0

Transition Table

Each state is assigned a unique code.

Present state	Next state xy/z 00	z	01	z	11	z	10	z
A	A	0	A	0	B	0	B	0
B	B	0	C	0	C	0	B	0
C	A	0	D	0	C	0	B	0
D	A	0	D	0	A	1	D	0

F_A	F_B	State
0	0	A
0	1	B
1	1	C
1	0	D

Present state F_A F_B	Next state xy/z 00 F_A F_B	z	01 F_A F_B	z	11 F_A F_B	z	10 F_A F_B	z
0 0	0 0	0	0 0	0	0 1	0	0 1	0
0 1	0 1	0	1 1	0	1 1	0	0 1	0
1 1	0 0	0	1 0	0	1 1	0	0 1	0
1 0	0 0	0	1 0	0	0 0	1	1 0	0

State Table

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Transition Table for state machine M_1

Present state F_A	Present state F_B	00 $F_A F_B$	00 z	01 $F_A F_B$	01 z	11 $F_A F_B$	11 z	10 $F_A F_B$	10 z
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

Next state xy/z

Transition Table for state machine M_1

Present State F_A	Present State F_B	Input X	Input Y	Next State F_A	Next State F_B	Output Z
0	0	0	0	0	0	0
0	0	0	1	0	0	0
0	0	1	0	0	1	0
0	0	1	1	0	1	0
0	1	0	0	0	1	0
0	1	0	1	1	1	0
0	1	1	0	0	1	0
0	1	1	1	1	1	0
1	0	0	0	0	0	0
1	0	0	1	1	0	0
1	0	1	0	1	0	0
1	0	1	1	0	0	1
1	1	0	0	0	0	0
1	1	0	1	1	0	0
1	1	1	0	0	1	0
1	1	1	1	1	1	0

Excitation Table and Equations

- Choose the type of flip-flops to design the state machine.
  - D
  - T
  - JK
  - SR

$$\begin{cases} Z = F(X, Q^n) & \text{输出方程} \\ Y = G(X, Q^n) & \text{驱动方程（激励方程、输入方程）} \\ Q^{n+1} = H(Y, Q^n) & \text{状态方程} \end{cases}$$

时序逻辑电路状态表

次态/输出 输入 现态	X
Q^n	Q^{n+1}/Z

时序逻辑电路状态表

X	Q^n	Q^{n+1}	Z

Excitation Table and Equations

D flip-flop used to realize circuit

D flip-flop characteristic table and equation

D	Present, Q_t	Next, Q_{t+1}
0	0	0
1	0	1
0	1	0
1	1	1

$Q_{t+1} = D$

Transition Table for state machine M_1

Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$F_A\ F_B$		$F_A\ F_B$		$F_A\ F_B$		$F_A\ F_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

D flip-flop excitation table

Q_t	Q_{t+1}	D
0	0	0
0	1	1
1	0	0
1	1	1

state machine M_1 excitation table using D flip-flops

Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$D_A\ D_B$		$D_A\ D_B$		$D_A\ D_B$		$D_A\ D_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

Excitation Table and Equations

■ **D flip-flop used to realize circuit (two D flip-flops)**

***D* flip-flop characteristic table and equation**

D	Present, Q_t	Next, Q_{t+1}
0	0	0
1	0	1
0	1	0
1	1	1

$Q_{t+1} = D$

Transition Table for state machine M_1

Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$F_A F_B$		$F_A F_B$		$F_A F_B$		$F_A F_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

D flip-flop excitation table

Q_t	Q_{t+1}	D
0	0	0
0	1	1
1	0	0
1	1	1

state machine M_1 excitation table using D flip-flops

Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$D_A D_B$		$D_A D_B$		$D_A D_B$		$D_A D_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

Excitation Table and Equations

D flip-flop used to realize circuit (two D flip-flops)

How to get the equations？

D flip-flop chara… and equation

D	Present, Q_t	Next, Q_{t+1}
0	0	0
1	0	1
0	1	0
1	1	1

$Q_{t+1} = D$

D_A D_B Z

…chine M_1

Present state F_A F_B	xy/z 00 $F_A F_B$	z	01 $F_A F_B$	z	11 $F_A F_B$	z	10 $F_A F_B$	z
0 0	0 0	0	0 0	0	0 1	0	0 1	0
0 1	0 1	0	1 1	0	1 1	0	0 1	0
1 1	0 0	0	1 0	0	1 1	0	0 1	0
1 0	0 0	0	1 0	0	0 0	1	1 0	0

D flip-flop excitation table

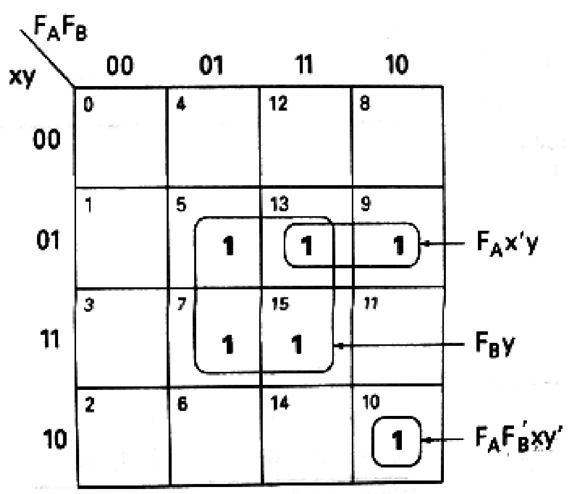
Q_t	Q_{t+1}	D
0	0	0
0	1	1
1	0	0
1	1	1

state machine M_1 excitation table using D flip-flops

Present state F_A F_B	Next state xy/z 00 $D_A D_B$	z	01 $D_A D_B$	z	11 $D_A D_B$	z	10 $D_A D_B$	z
0 0	0 0	0	0 0	0	0 1	0	0 1	0
0 1	0 1	0	1 1	0	1 1	0	0 1	0
1 1	0 0	0	1 0	0	1 1	0	0 1	0
1 0	0 0	0	1 0	0	0 0	1	1 0	0

Excitation Table and Equations

Present state		Next state xy/z											
		00		z	01		z	11		z	10		z
F_A	F_B	D_A	D_B		D_A	D_B		D_A	D_B		D_A	D_B	
0	0	0	0	0	0	0	0	0	1	0	0	1	0
0	1	0	1	0	1	1	0	1	1	0	0	1	0
1	1	0	0	0	1	0	0	1	1	0	0	1	0
1	0	0	0	0	1	0	0	0	0	1	1	0	0

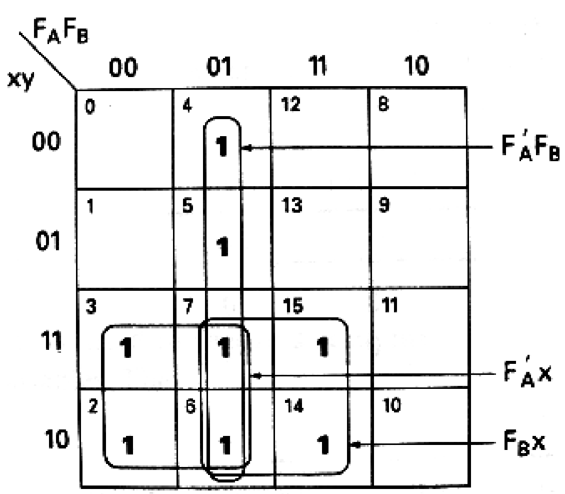


D_A K-Map

$D_A=f(F_A,F_B,x,y)=\Sigma(5,7,10,13,15)=F_AF_B'xy'+F_Ax'y+F_By$

Excitation Table and Equations

Present state		Next state xy/z											
		00		z	01		z	11		z	10		z
F_A	F_B	D_A	D_B		D_A	D_B		D_A	D_B		D_A	D_B	
0	0	0	0	0	0	0	0	0	1	0	0	1	0
0	1	0	1	0	1	1	0	1	1	0	0	1	0
1	1	0	0	0	1	0	0	1	1	0	0	1	0
1	0	0	0	0	1	0	0	0	0	1	1	0	0



D_B K-Map

$D_B = f(F_A, F_B, x, y)$

$= \Sigma(2,3,4,5,6,7,14,15)$

$= F_A'F_B + F_A'x + F_Bx$

Excitation Table and Equations

Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$D_A\ D_B$		$D_A\ D_B$		$D_A\ D_B$		$D_A\ D_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

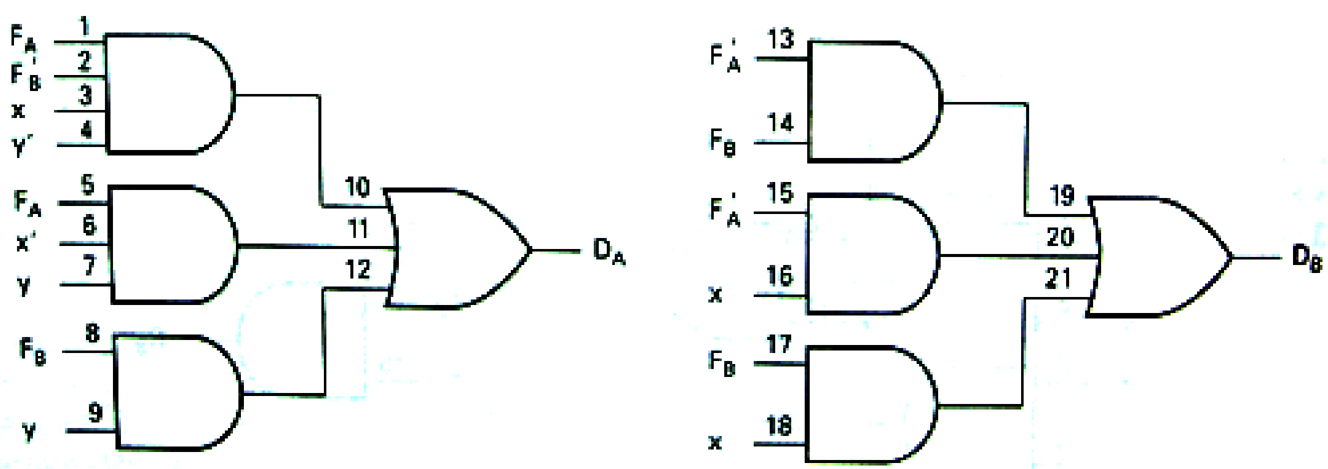
$Z= f(F_A,F_B,x,y)=\Sigma(11)$

$=F_AF_B'xy$

$D_A=F_AF_B'xy'+F_Ax'y+F_By$

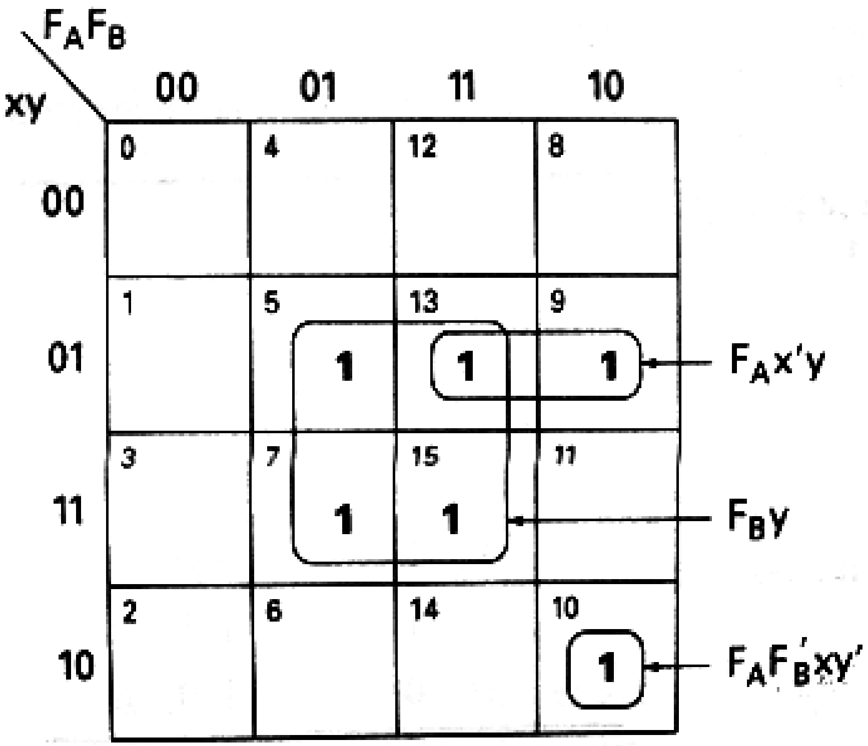
$D_B=F_A'F_B+F_A'x+F_Bx$

Logic for *D* excitation realization

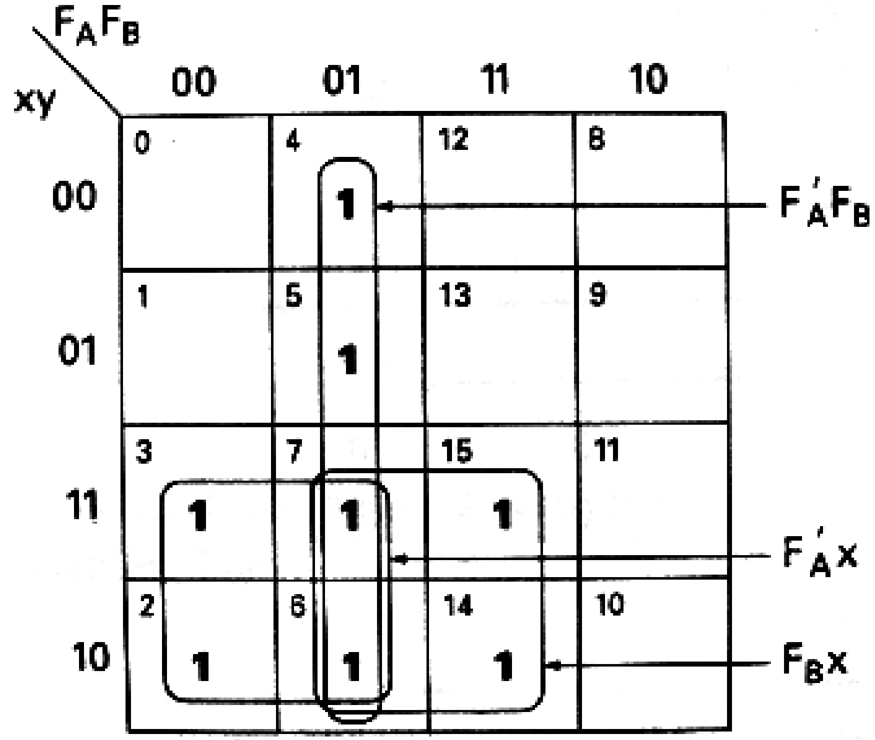


COST = 21 GATE INPUTS

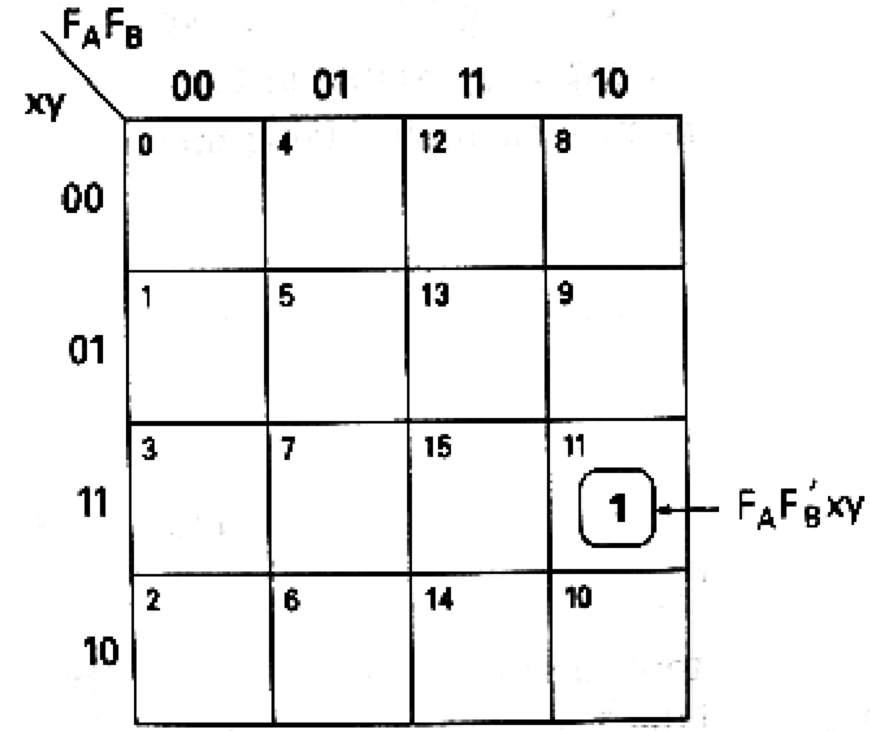
Excitation Table and Equations



D_A K-Map



D_B K-Map



Z K-Map

$$D_A=f(F_A,F_B,x,y)=\Sigma(5,7,10,13,15)=F_AF_B'xy'+F_Ax'y+F_By$$

$$D_B=f(F_A,F_B,x,y)=\Sigma(2,3,4,5,6,7,14,15)=F_A'F_B+F_A'x+F_Bx$$

$$Z= f(F_A,F_B,x,y)=\Sigma(11)=F_AF_B'xy$$

Excitation Table and Equations

- **T flip-flop used to realize circuit**

T flip-flop characteristic table and equation

	Present	Next
T	Q_t	Q_{t+1}
0	0	0
1	0	1
1	1	0
0	1	1

$Q_{t+1} = T \oplus Q_t$

T flip-flop excitation table

Q_t	Q_{t+1}	T
0	0	0
0	1	1
1	0	1
1	1	0

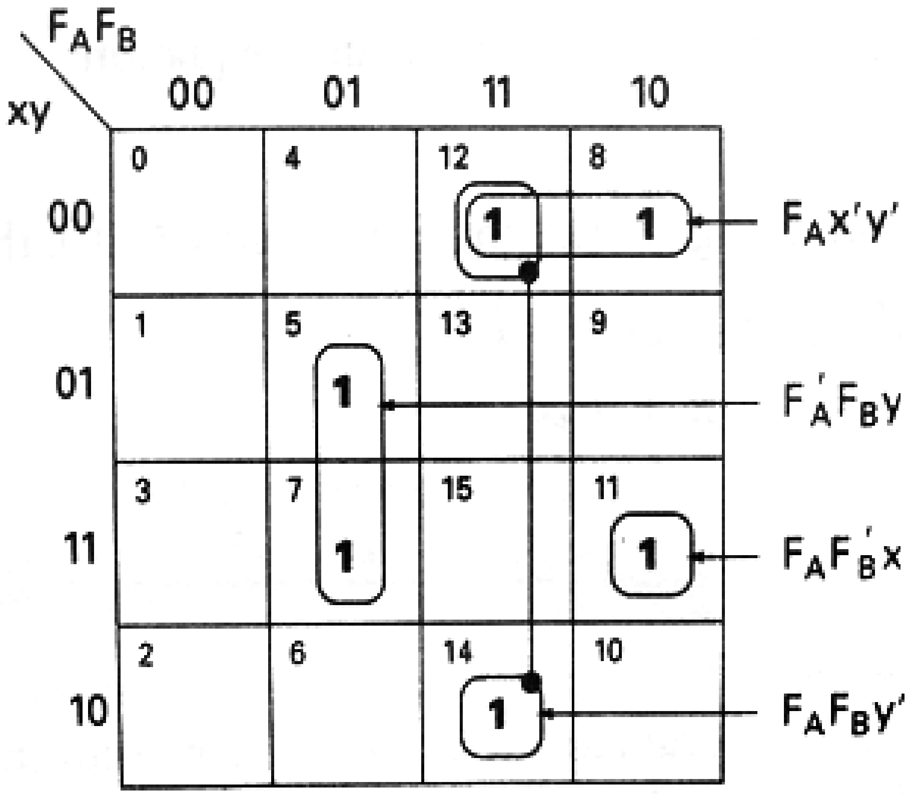
Transition Table for state machine M_1

Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$F_A\ F_B$		$F_A\ F_B$		$F_A\ F_B$		$F_A\ F_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

T flip-flop excitation table for state machine M_1

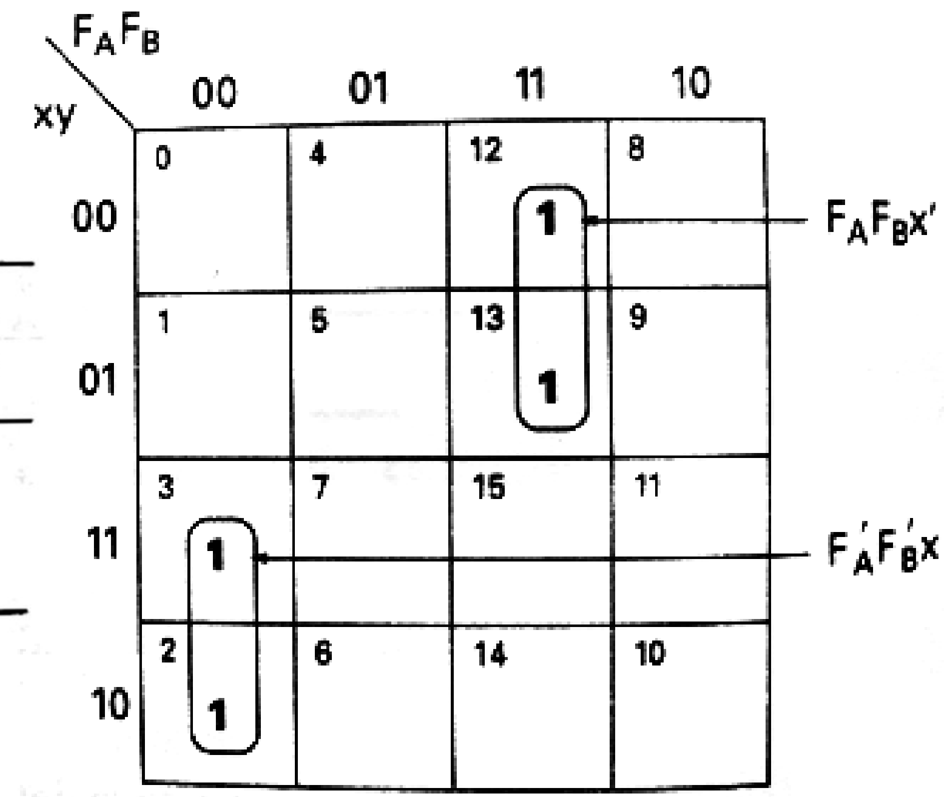
Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$T_A\ T_B$		$T_A\ T_B$		$T_A\ T_B$		$T_A\ T_B$	
0	0								
0	1								
1	1								
1	0								

Excitation Table and Equations



T_A K-Map

Present state F_A	F_B	Next state xy/z 00 T_A T_B	z	01 T_A T_B	z	11 T_A T_B	z	10 T_A T_B	z
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 0	0	1 0	0	1 0	0	0 0	0
1	1	1 1	0	0 1	0	0 0	0	1 0	0
1	0	1 0	0	0 0	0	1 0	1	0 0	0



T_B K-Map

$$T_A=f(F_A,F_B,x,y)=\Sigma(5,7,8,11,12,14)=F_AF_B'xy+F_Ax'y'+F_AF_By'+F_A'F_By$$

$$T_B=f(F_A,F_B,x,y)=\Sigma(2,3,12,13)=F_A'F_B'x+F_AF_Bx'$$

Excitation Table and Equations

- S-R flip-flop used to realize circuit

R–S flip-flop characteristic table and equation

Present S	Present R	Present Q_t	Next Q_{t+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	Undefined
1	1	1	Undefined

$Q_{t+1} = S + R'Q_t$

Transition Table for state machine M_1

Present state F_A	F_B	Next state xy/z: 00 $F_A F_B$	z	01 $F_A F_B$	z	11 $F_A F_B$	z	10 $F_A F_B$	z
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

S-R flip-flop excitation table

Q_t	Q_{t+1}	S	R
0	0	0	d
0	1	1	0
1	0	0	1
1	1	d	0

state machine M_1 excitation table using S-R flip-flops

Present state F_A	F_B	Next state xy/z: 00 $S_A R_A$	$S_B R_B$	z	01 $S_A R_A$	$S_B R_B$	z	11 $S_A R_A$	$S_B R_B$	z	10 $S_A R_A$	$S_B R_B$	z
0	0												
0	1												
1	1												
1	0												

Excitation Table and Equations

S-R flip-flop used to realize circuit (two SR flip-flops)

R–S flip-flop characteristic table and equation

Present			Next
S	R	Q_t	Q_{t+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	Undefined
1	1	1	Undefined

$Q_{t+1} = S + R'Q_t$

Transition Table for state machine M_1

Present state		Next state xy/z							
		00	z	01	z	11	z	10	z
F_A	F_B	$F_A F_B$		$F_A F_B$		$F_A F_B$		$F_A F_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

S-R flip-flop excitation table

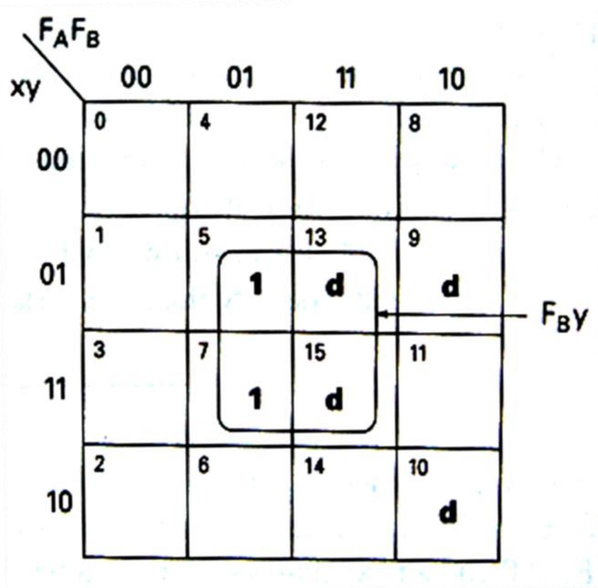
Q_t	Q_{t+1}	S	R
0	0	0	d
0	1	1	0
1	0	0	1
1	1	d	0

state machine M_1 excitation table using S-R flip-flops

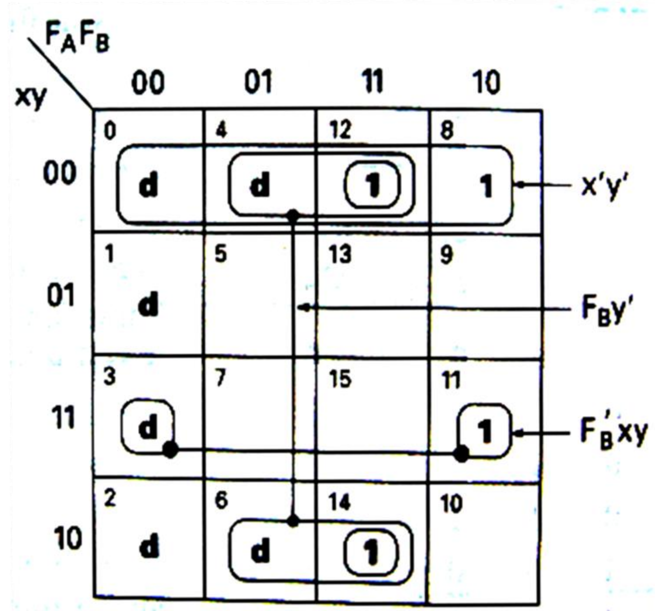
Present state		Next state xy/z											
		00		z	01		z	11		z	10		z
F_A	F_B	$S_A R_A$	$S_B R_B$		$S_A R_A$	$S_B R_B$		$S_A R_A$	$S_B R_B$		$S_A R_A$	$S_B R_B$	
0	0	0d	0d	0	0d	0d	0	0d	10	0	0d	10	0
0	1	0d	d0	0	10	d0	0	10	d0	0	0d	d0	0
1	1	01	01	0	d0	01	0	d0	d0	0	01	d0	0
1	0	01	0d	0	d0	0d	0	01	0d	1	d0	0d	0

Excitation Table and Equations

Present state		Next state xy/z											
		00		z	01		z	11		z	10		z
F_A	F_B	S_AR_A	S_BR_B		S_AR_A	S_BR_B		S_AR_A	S_BR_B		S_AR_A	S_BR_B	
0	0	0d	0d	0	0d	0d	0	0d	10	0	0d	10	0
0	1	0d	d0	0	10	d0	0	10	d0	0	0d	d0	0
1	1	01	01	0	d0	01	0	d0	d0	0	01	d0	0
1	0	01	0d	0	d0	0d	0	01	0d	1	d0	0d	0



S_A K-Map



R_A K-Map

$S_A=f(F_A,F_B,x,y)$

$=\Sigma(5,7)+\Sigma d(9,10,13,15)=F_By$

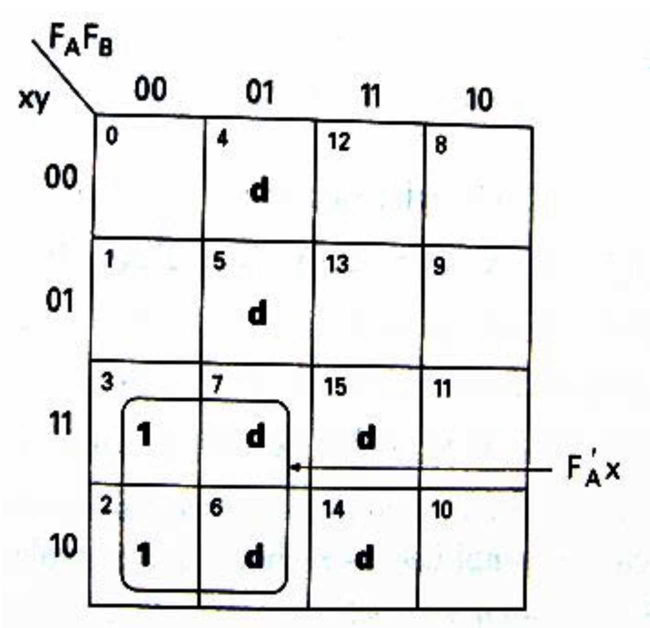
$R_A=f(F_A,F_B,x,y)$

$=\Sigma(8,11,12,14)+\Sigma d(0,1,2,3,4,6)$
$=F_B'xy+x'y'+F_By'$

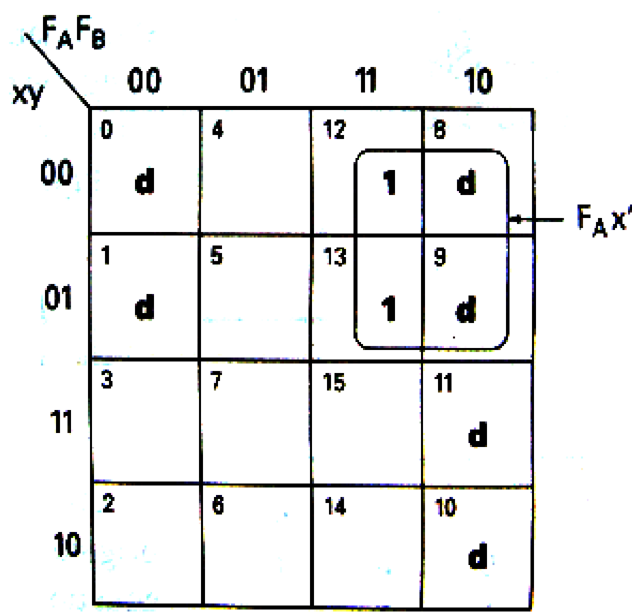
Excitation Table and Equations

Present state F_A	F_B	00 S_AR_A	00 S_BR_B	00 z	01 S_AR_A	01 S_BR_B	01 z	11 S_AR_A	11 S_BR_B	11 z	10 S_AR_A	10 S_BR_B	10 z
0	0	0d	0d	0	0d	0d	0	0d	10	0	0d	10	0
0	1	0d	d0	0	10	d0	0	10	d0	0	0d	d0	0
1	1	01	01	0	d0	01	0	d0	d0	0	01	d0	0
1	0	01	0d	0	d0	0d	0	01	0d	1	d0	0d	0

(Next state xy/z)



S_B K-Map



R_B K-Map

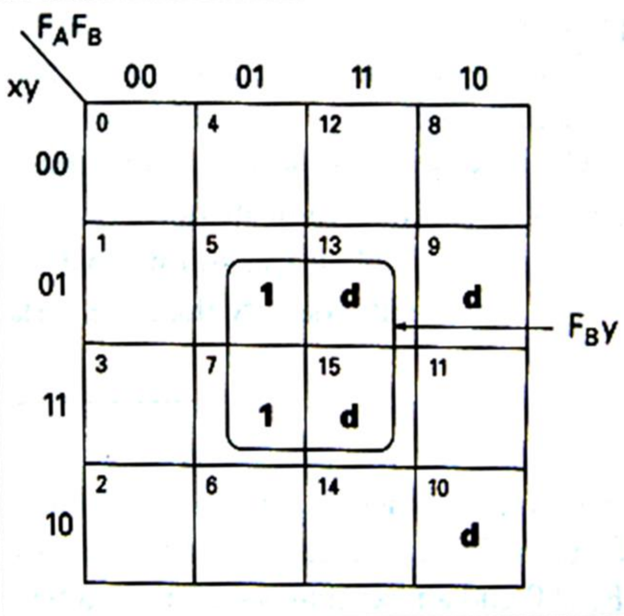
$S_B=f(F_A,F_B,x,y)$

$=\Sigma(2,3)+\Sigma d(4,5,6,7,14,15)=F_A'x$

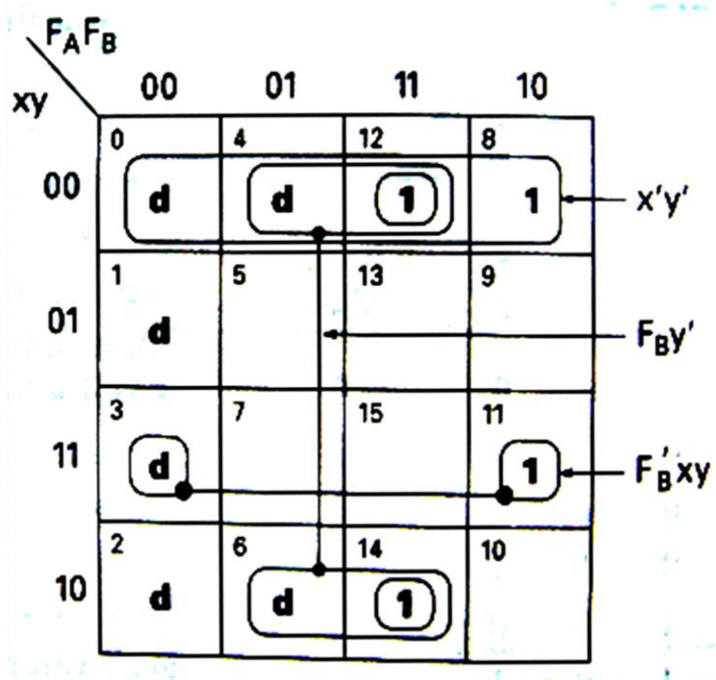
$R_B=f(F_A,F_B,x,y)$

$=\Sigma(12,13)+\Sigma d(0,1,8,9,10,11)=F_Ax'$

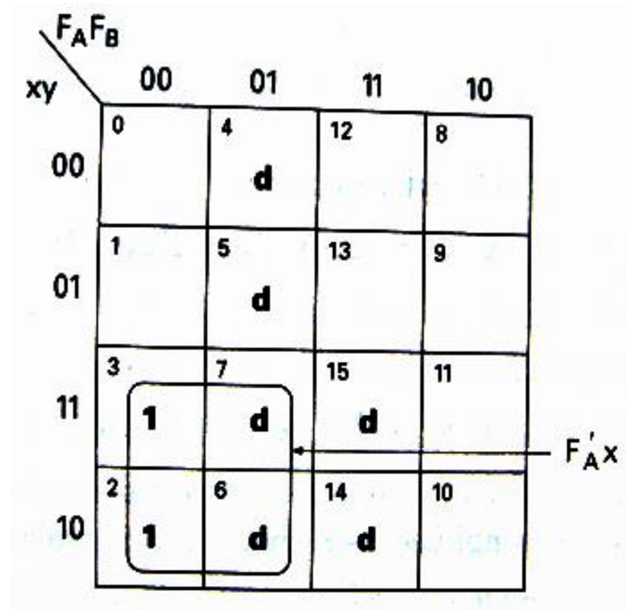
Excitation Table and Equations



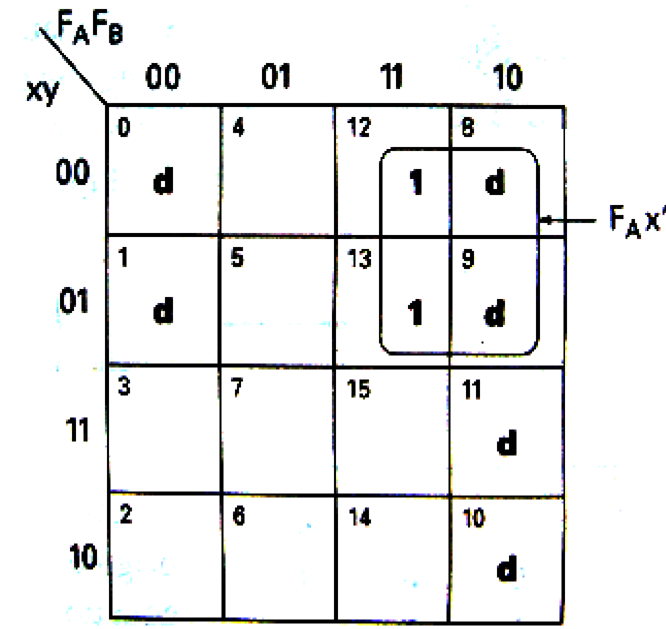
S_A K-Map



R_A K-Map



S_B K-Map



R_B K-Map

$S_A=f(F_A,F_B,x,y)=\Sigma(5,7)+\Sigma d(9,10,13,15)=F_By$

$R_A=f(F_A,F_B,x,y)=\Sigma(8,11,12,14)+\Sigma d(0,1,2,3,4,6)=F_B'xy+x'y'+F_By'$

$S_B=f(F_A,F_B,x,y)=\Sigma(2,3)+\Sigma d(4,5,6,7,14,15)=F_A'x$

$R_B=f(F_A,F_B,x,y)=\Sigma(12,13)+\Sigma d(0,1,8,9,10,11)=F_Ax'$

Excitation Table and Equations

- **J-K flip-flop used to realize circuit**

J–K flip-flop characteristic table and equation

Present			Next
J	*K*	Q_t	Q_{t+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

$Q_{t+1} = JQ_t' + K'Q_t$

J-K flip-flop excitation table

Q_t	Q_{t+1}	J	K
0	0	0	d
0	1	1	d
1	0	d	1
1	1	d	0

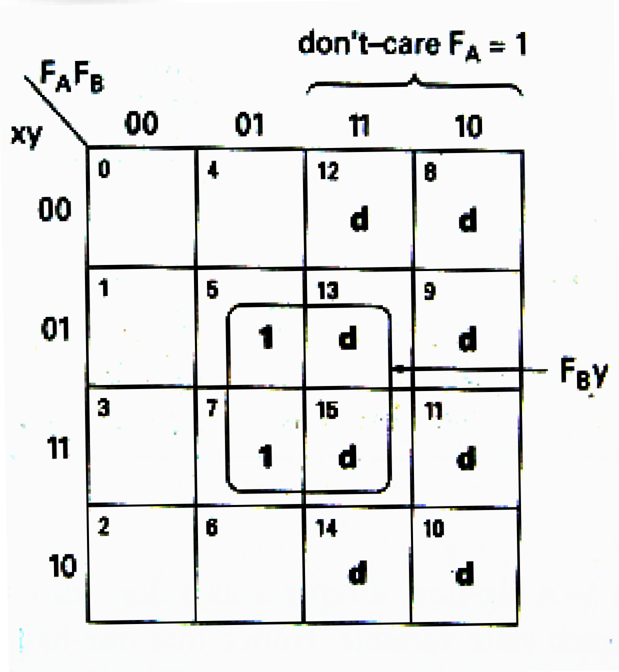
Transition Table for state machine M_1

Present state		Next state *xy/z*							
		00	z	01	z	11	z	10	z
F_A	F_B	$F_A\ F_B$		$F_A\ F_B$		$F_A\ F_B$		$F_A\ F_B$	
0	0	0 0	0	0 0	0	0 1	0	0 1	0
0	1	0 1	0	1 1	0	1 1	0	0 1	0
1	1	0 0	0	1 0	0	1 1	0	0 1	0
1	0	0 0	0	1 0	0	0 0	1	1 0	0

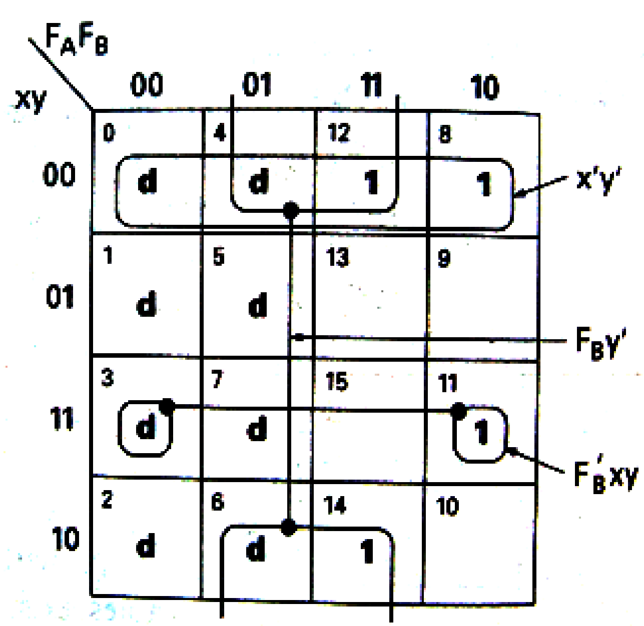
state machine M_1 excitation table using J-K flip-flops

Present state		Next state *xy/z*											
		00		z	01		z	11		z	10		z
F_A	F_B	J_AK_A	J_BK_B		J_AK_A	J_BK_B		J_AK_A	J_BK_B		J_AK_A	J_BK_B	
0	0												
0	1												
1	1												
1	0												

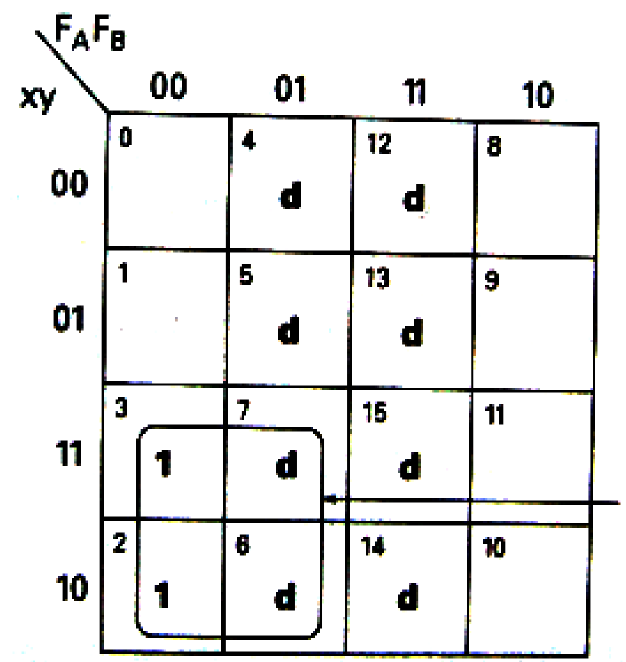
Excitation Table and Equations



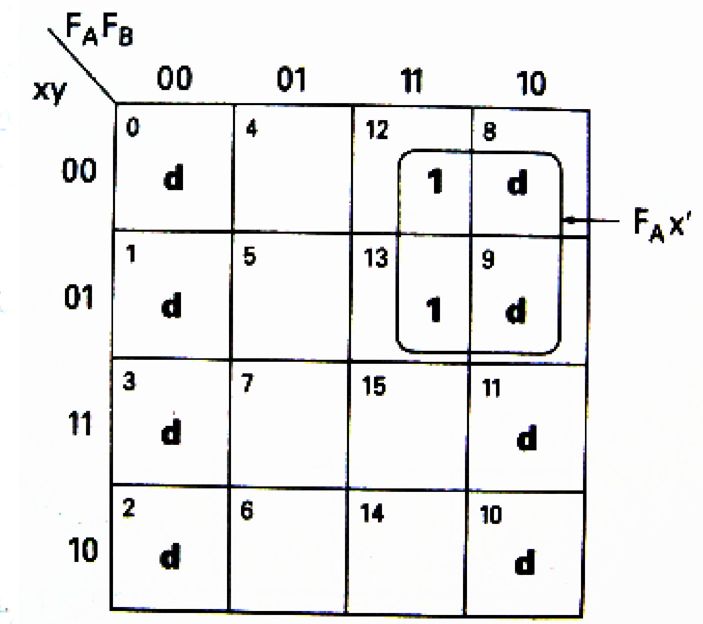
J_A K-Map



K_A K-Map



J_B K-Map



K_B K-Map

$$J_A=f(F_A,F_B,x,y)=\Sigma(5,7)+\Sigma d(8,9,10,11,12,13,14,15)=F_By$$

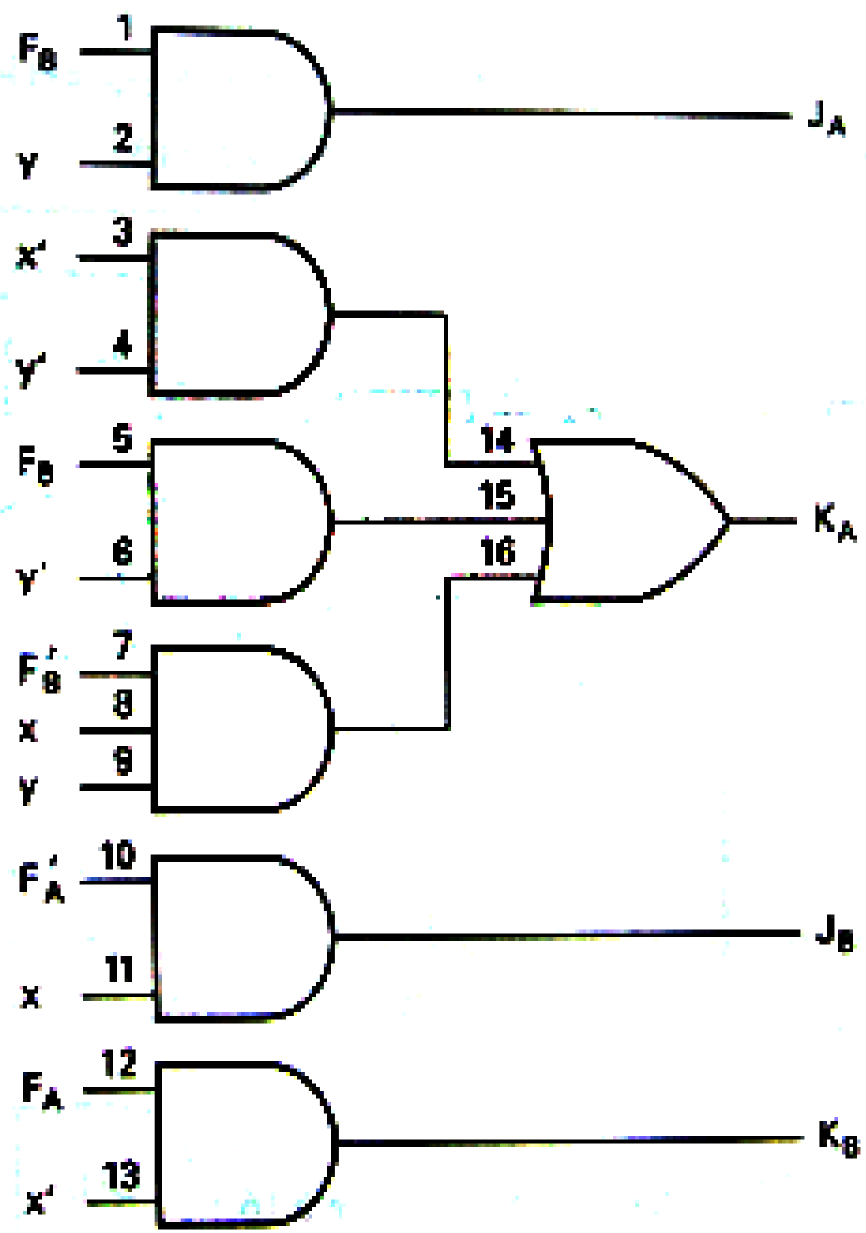
$$K_A=f(F_A,F_B,x,y)=\Sigma(8,11,12,14)+\Sigma d(0,1,2,3,4,6,7)=F_B'xy+x'y'+F_By'$$

$$J_B=f(F_A,F_B,x,y)=\Sigma(2,3)+\Sigma d(4,5,6,7,12,13,14,15)=F_A'x$$

$$K_B=f(F_A,F_B,x,y)=\Sigma(12,13)+\Sigma d(0,1,2,3,8,9,10,11)=F_Ax'$$

Present state		Next state xy/z											
		00		z	01		z	11		z	10		z
F_A	F_B	J_AK_A	J_BK_B		J_AK_A	J_BK_B		J_AK_A	J_BK_B		J_AK_A	J_BK_B	
0	0	0d	0d	0	0d	0d	0	0d	1d	0	0d	1d	0
0	1	0d	d0	0	1d	d0	0	1d	d0	0	0d	d0	0
1	1	d1	d1	0	d0	d1	0	d0	d0	0	d1	d0	0
1	0	d1	0d	0	d0	0d	0	d1	0d	1	d0	0d	0

Excitation Realization Cost



COST = 16 GATE INPUTS

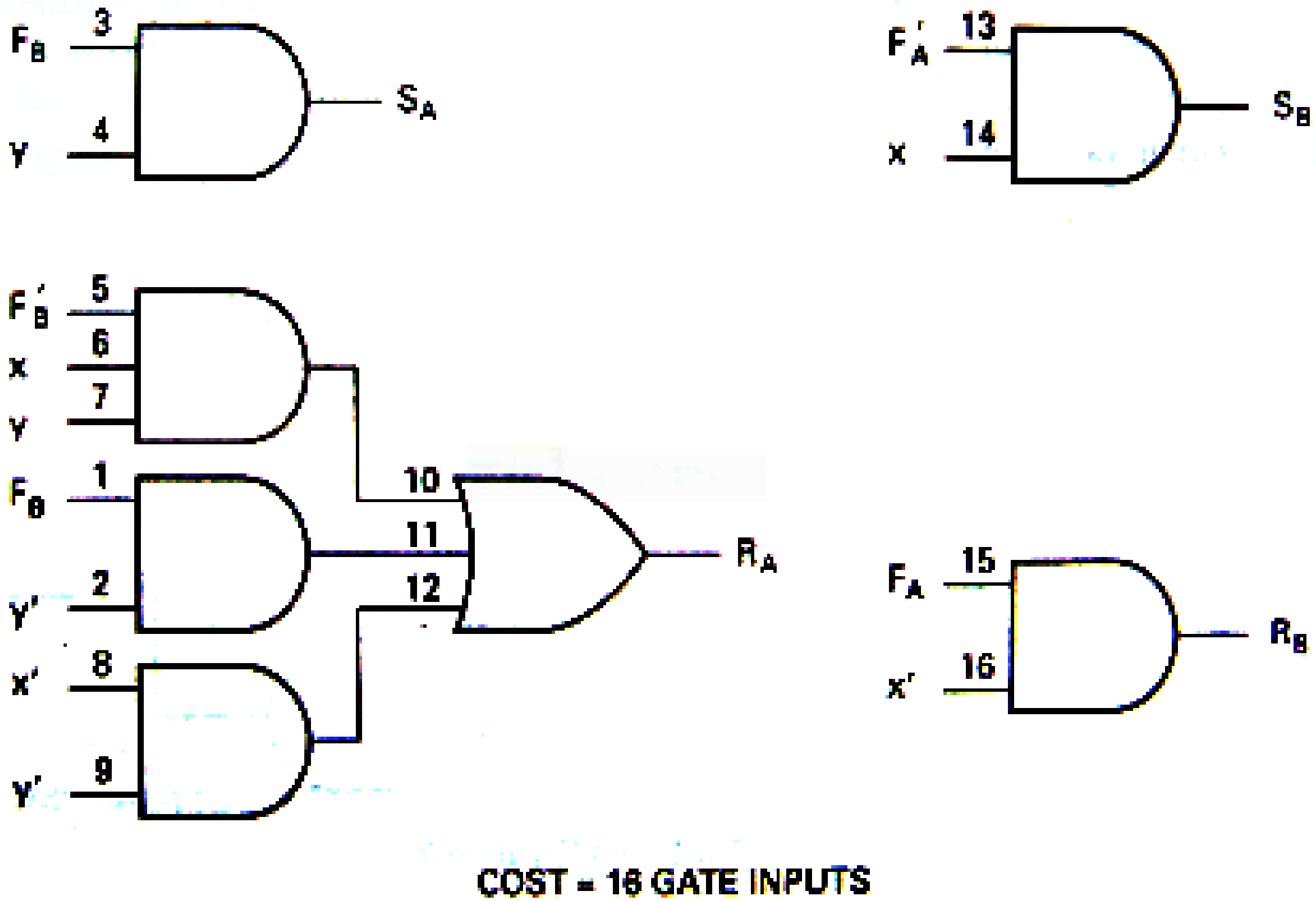
$J_A = F_B y$

$K_A = F_B' xy + x'y' + F_B y'$

$J_B = F_A' x$

$K_B = F_A x'$

Excitation Realization Cost



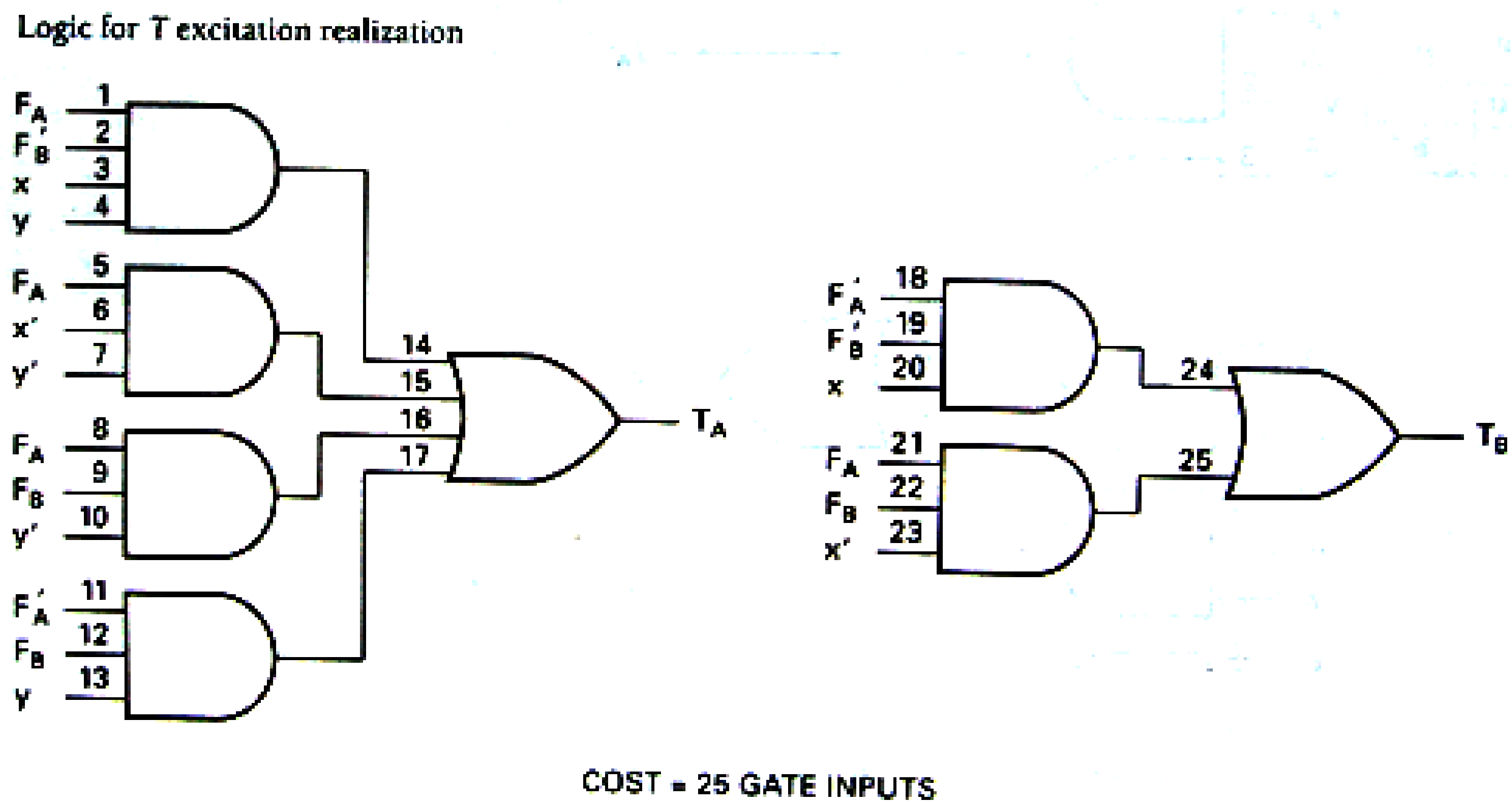
$S_A = F_B y$

$R_A = F_B' xy + x'y' + F_B y'$

$S_B = F_A' x$

$R_B = F_A x'$

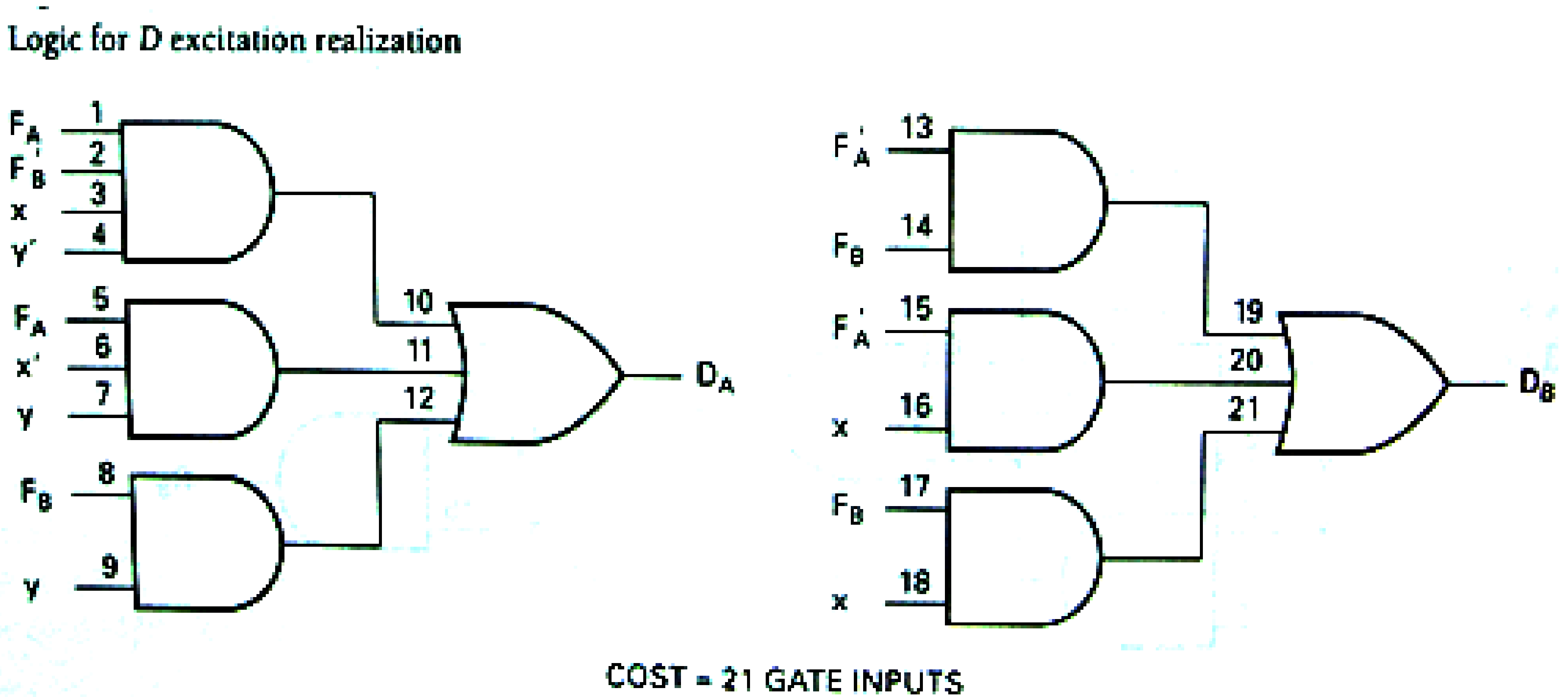
Excitation Realization Cost



$$T_A = F_A F_B' xy + F_A x' y' + F_A F_B y' + F_A' F_B y$$

$$T_B = F_A' F_B' x + F_A F_B x'$$

Excitation Realization Cost

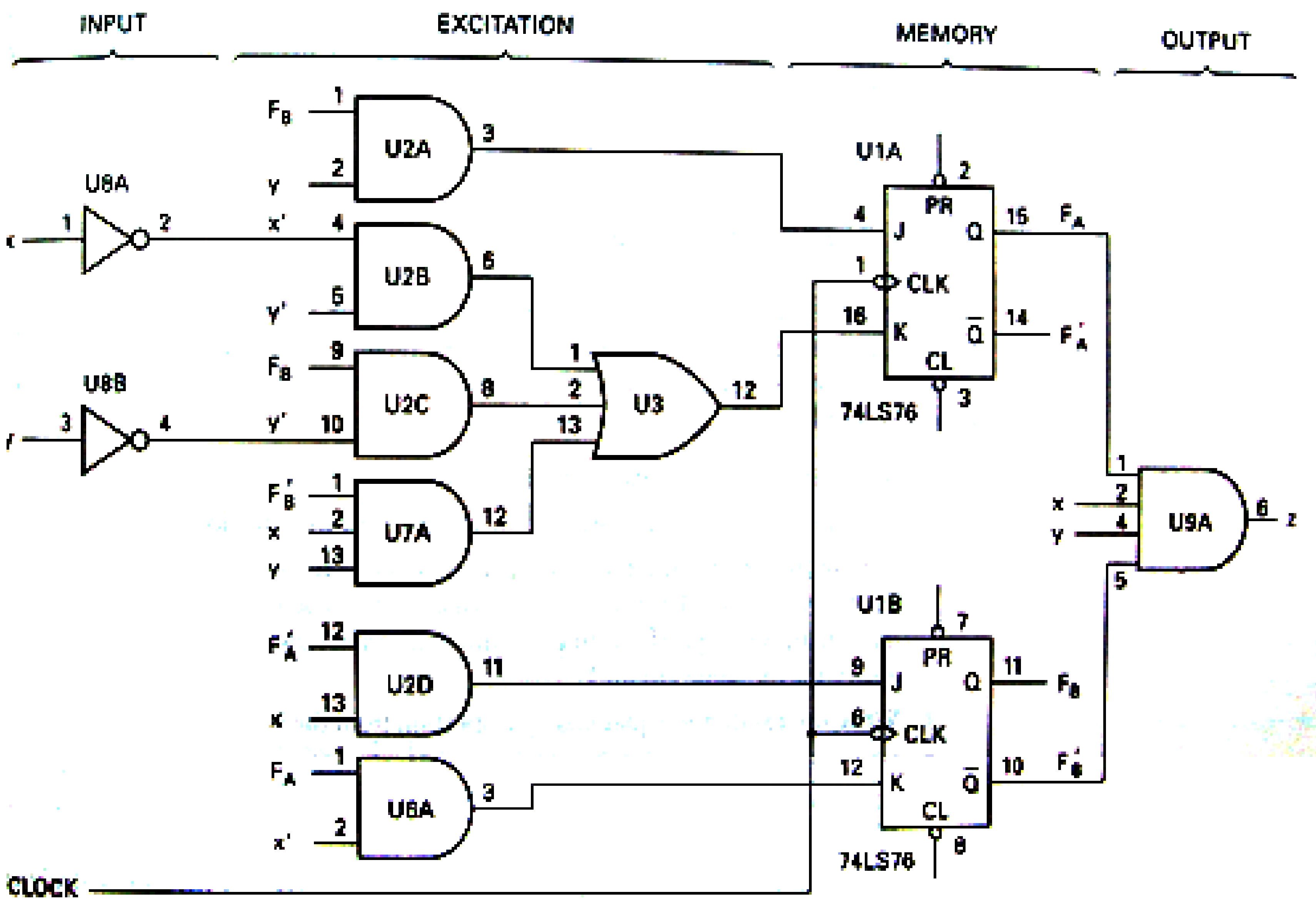


$$D_A = F_A F_B' x y' + F_A x' y + F_B y$$

$$D_B = F_A' F_B + F_A' x + F_B x$$

Excitation Realization Cost

Logic diagram for J–K realization of example sequential circuit (M_1)



$Z= F_AF_B'xy$

Homework

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SICHUAN UNIVERSITY

Thanks