

# Introduction to Logic and Computer Design

## Final Exam

학번 :

이름 :

1. 3-bit input  $x$  를 입력 받아  $2x^2$ 을 결과로 출력하는 combinational circuit 을 설계하시오.[20]

Input			Output						
a	b	c	d	e	f	g	h	i	J
0	0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	1	0
0	1	0	0	0	0	1	0	0	0
0	1	1	0	0	1	0	0	1	0
1	0	0	0	1	0	0	0	0	0
1	0	1	0	1	1	0	0	1	0
1	1	0	1	0	0	1	0	0	0
1	1	1	1	1	0	0	0	1	0

$$D = ab$$

A	bc	00	01	11	10
0		0	0	0	0
1		0	0	1	1

$$E = ab' + ac$$

A	bc	00	01	11	10
0		0	0	0	0
1		1	1	1	0

$$F = ab'c + a'bc$$

A	bc	00	01	11	10
0		0	0	1	0
1		0	1	0	0

$$G = bc'$$

A	bc	00	01	11	10
0		0	0	0	1
1		0	0	0	1

$$H = 0$$

A	bc	00	01	11	10
0		0	0	0	0
1		0	0	0	0

$$I = c$$

A	bc	00	01	11	10
0		0	1	1	0
1		0	1	1	0

$$J = 0$$

A	bc	00	01	11	10
0		0	0	0	0
1		0	0	0	0



2. 다음과 같은 시퀀스를 가지는 동기 카운터를 JK 플립플롭을 이용해 설계하시오. [20]  
( 진리표, K-map )

1 3 5 7 4 2 0 6 and repeat

A	B	C	A*	B*	C*
0	0	0	1	1	0
0	0	1	0	1	1
0	1	0	0	0	0
0	1	1	1	0	1
1	0	0	0	1	0
1	0	1	1	1	1
1	1	0	0	0	1
1	1	1	1	0	0

A\*

	A	
BC	0	1
00	1	
01		1
11	1	1
10		

B\*

	A	
BC	0	1
00	1	1
01	1	1
11		
10		

C\*

	A	
BC	0	1
00		
01	1	1
11	1	
10		1

$$D_A = A'B'C' + AC + A'BC$$

$$D_B = B'$$

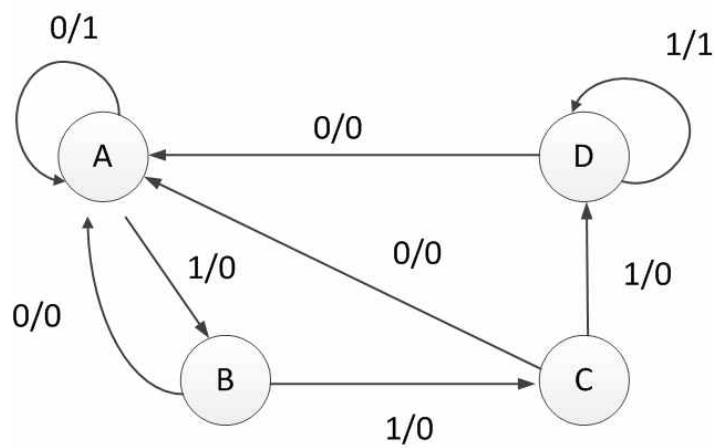
$$D_C = B'C + ABC' + A'BC$$

3. 다음의 문제에 대해 state table과 state diagram을 그리시오.[20]

네 개 이상의 연속적인 1 입력이 들어올 때나 두 개 이상의 연속적인 0 입력이 들어올 때 1 출력을 내보내는 밀리 시스템

x 0 1 1 0 0 1 0 0 1 1 1 1 1 0 0 0 1  
z ? 0 0 0 1 0 0 1 0 0 0 1 1 0 1 1 0 0

q	q*		z	
	x=0	x=1	x=0	x=1
A	A	B	1	0
B	A	C	0	0
C	A	D	0	0
D	A	D	0	1



4.

A B	A*		B*		z	
	x=0	x=1	x=0	x=1	x=0	x=1
0 0	1 0	1 1	0	0	0	0
0 1	0 0	0 1	0	0	0	0
1 0	0 1	1 1	1	0	1	0
1 1	0 0	0 0	1	1	1	1

설계에서는 AND, OR, NOT gate를 이용해서 Block diagram을 그리시오.[20]

(i) 주어진 state table에 대해 JK Flip-flop을 사용하여 시스템을 설계하시오.

(ii) K-map을 그리고 Equation을 보이시오.

b.

x	A	B	A*	B*	z	S <sub>A</sub>	R <sub>A</sub>	S <sub>B</sub>	R <sub>B</sub>	T <sub>A</sub>	T <sub>B</sub>
0	0	0	1	0	0	1	0	0	X	1	0
0	0	1	0	0	0	0	X	0	1	0	1
0	1	0	0	1	1	0	1	1	0	1	1
0	1	1	0	0	1	0	1	0	1	1	1
1	0	0	1	1	0	1	0	1	0	1	1
1	0	1	0	1	0	0	X	X	0	0	0
1	1	0	1	1	0	X	0	1	0	0	1
1	1	1	0	0	1	0	1	0	1	1	1

The output is

$$z = x' A + A B$$

To obtain the D and J K inputs, we map A\* and B\* (using the quick method for the JK flip flops).

A B	x	
	0	1
00	1	1
01		
11		
10		1

A\*

A B	x	
	0	1
00		1
01		1
11		
10	1	1

B\*

$$D_A = A' B' + x B'$$

$$J_A = B'$$

$$K_A = x' + B$$

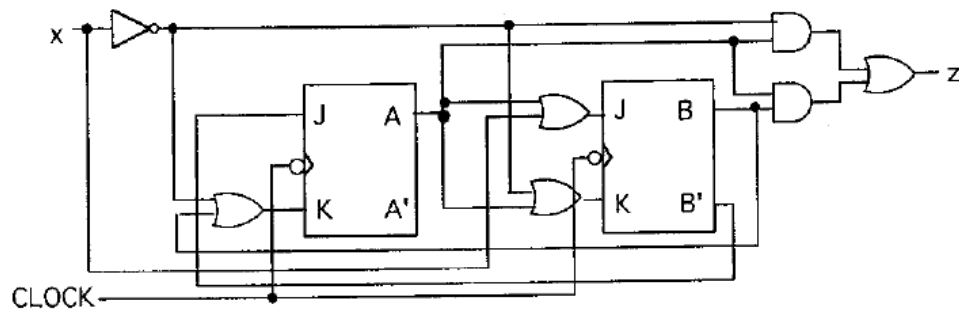
$$D_B = x A' + A B'$$

$$J_B = x + A$$

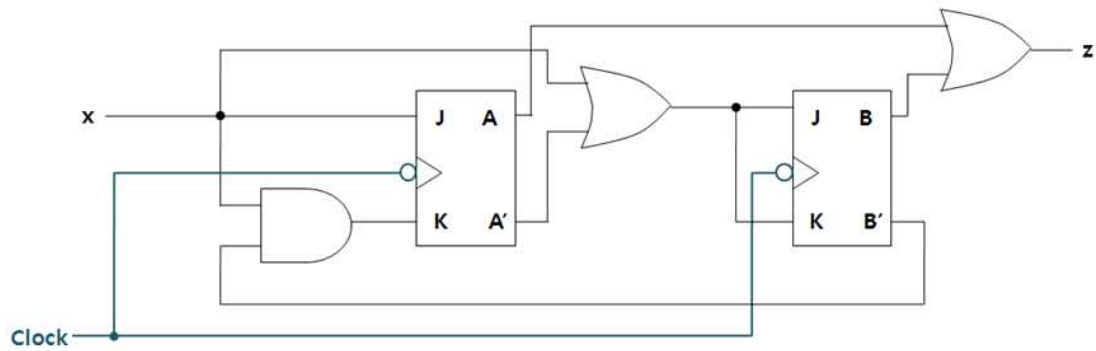
$$K_B = x' + A$$

$$\begin{array}{llll} S_A = A' B' & R_A = x' A + B & S_B = x A' + A B' & R_B = A B + \{x' B \text{ or } x' A'\} \\ T_A = A' B' + A B + \{x' A \text{ or } x' B'\} & & T_B = A + x' B + x B' & \end{array}$$

The circuit for the JK design is



5. 다음의 Logic 회로에 대해서[20]



(a) State table을 작성하시오

Table 5.9c Completed state table.

$A$ $B$	$A^* B^*$		$z$
	$x = 0$	$x = 1$	
0 0	0 1	1 1	0
0 1	0 0	1 0	1
1 0	1 0	0 1	1
1 1	1 1	1 0	1

(b) State diagram을 그리시오.

