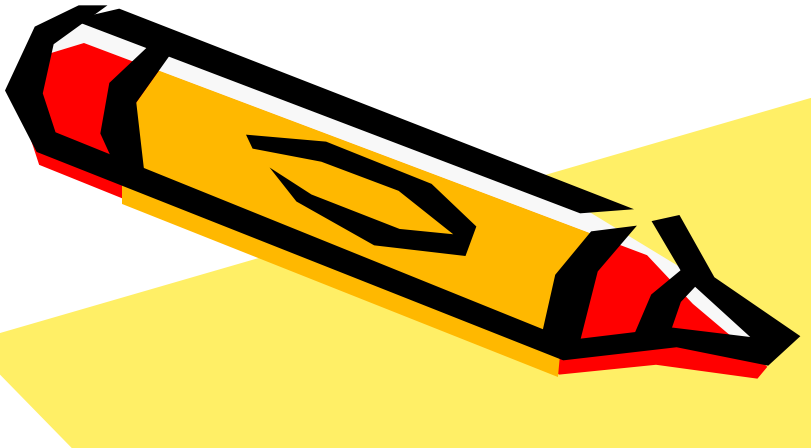
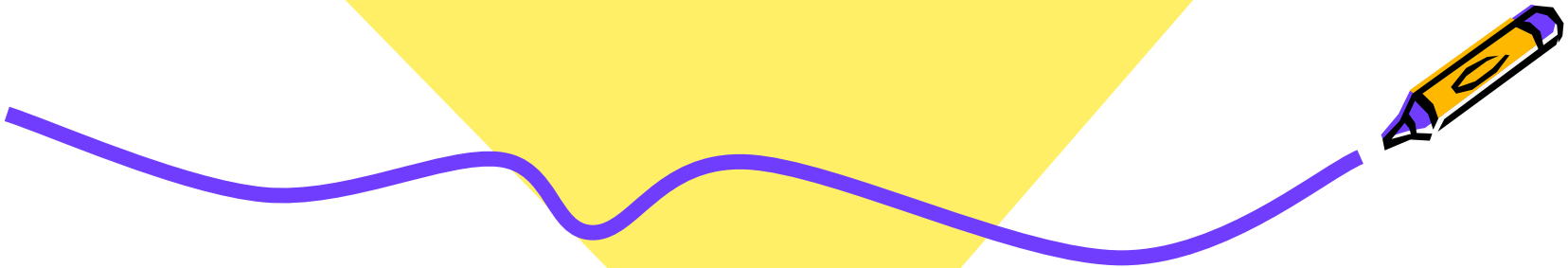


Logic Design

CSE 221

Dr. Mohamed Osama Khozium

Design Procedure

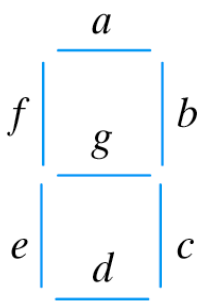


Design Procedure

1. From the specifications of the circuit, determine the required number of inputs and outputs and assigned a letter symbol to each
2. Derive the truth table that defined the relationship between inputs and outputs
3. Obtain the simplified Boolean functions for each output as a function of the input variables
4. Draw the logic diagram
5. Verify the correctness of the design

Some Design Examples

- BCD to Excess-3 code converter
- BCD to Seven Segment Decoder



(a) Segment designation

(b) Numerical designation for display

Fig. P4-9

BCD to Excess-3 code converter

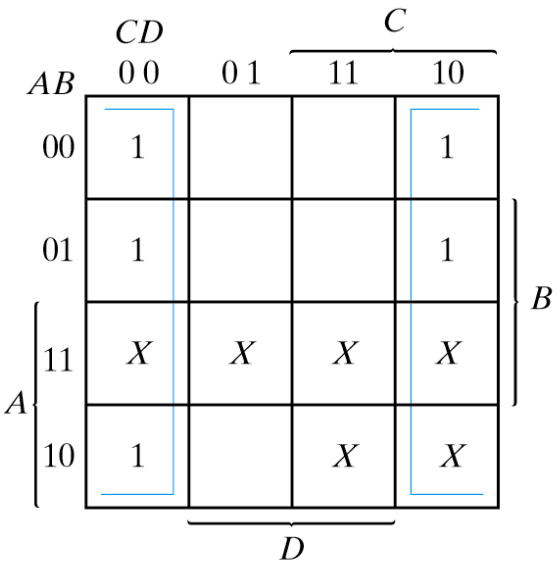
TABLE 3-2
Truth Table for Code Converter Example

Decimal Digit	Input BCD				Output Excess-3			
	A	B	C	D	W	X	Y	Z
0	0	0	0	0	0	0	1	1
1	0	0	0	1	0	1	0	0
2	0	0	1	0	0	1	0	1
3	0	0	1	1	0	1	1	0
4	0	1	0	0	0	1	1	1
5	0	1	0	1	1	0	0	0
6	0	1	1	0	1	0	0	1
7	0	1	1	1	1	0	1	0
8	1	0	0	0	1	0	1	1
9	1	0	0	1	1	1	0	0

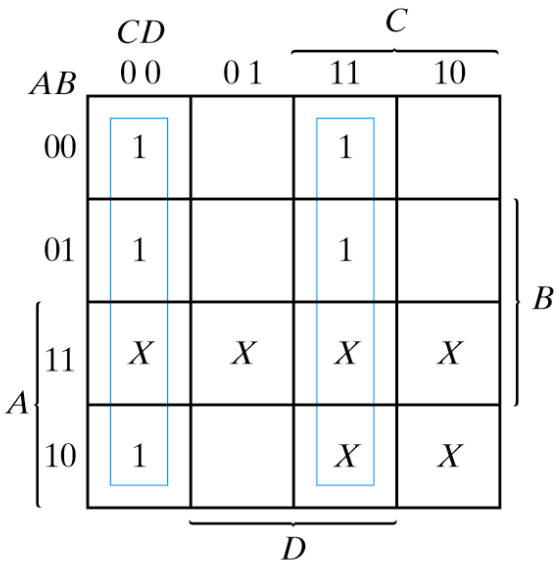
- 9 (in) → X (don't care) in output till 15

InPuts				OutPuts			
A	B	C	D	W	X	Y	Z
0	0	0	0	0	0	1	1
0	0	0	1	0	1	0	0
0	0	1	0	0	1	0	1
0	0	1	1	0	1	1	0
0	1	0	0	0	1	1	1
0	1	0	1	1	0	0	0
0	1	1	0	1	0	0	1
0	1	1	1	1	0	1	0
1	0	0	0	1	0	1	1
1	0	0	1	1	1	0	0
1	0	1	0	x	x	x	x
1	0	1	1	x	x	x	x
1	1	0	0	x	x	x	x
1	1	0	1	x	x	x	x
1	1	1	0	x	x	x	x
1	1	1	1	x	x	x	x

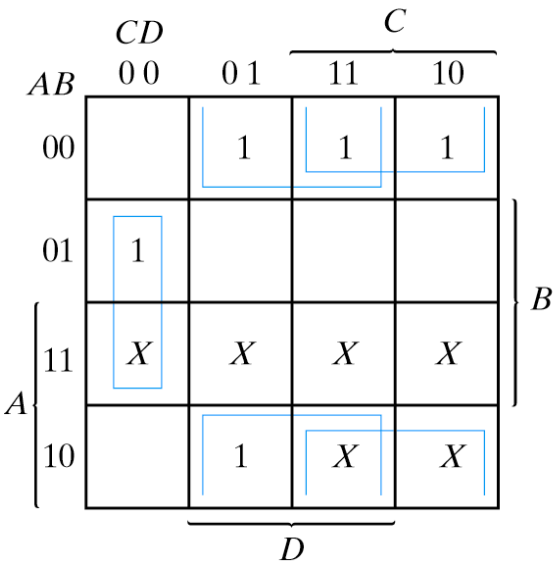
BCD to Excess-3 code converter K-Maps



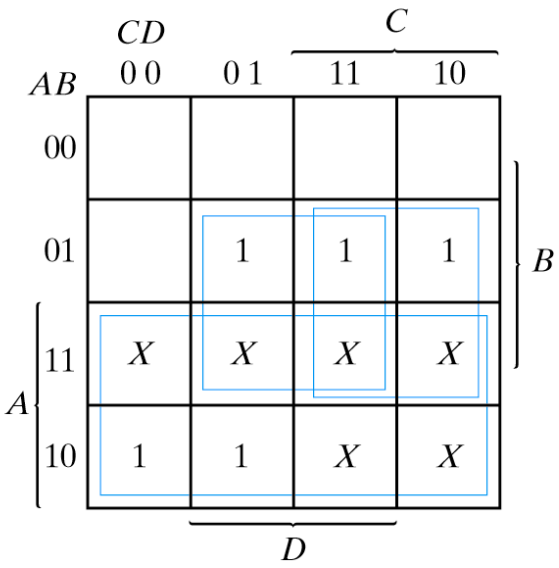
$z = D'$



$y = CD + C'D'$

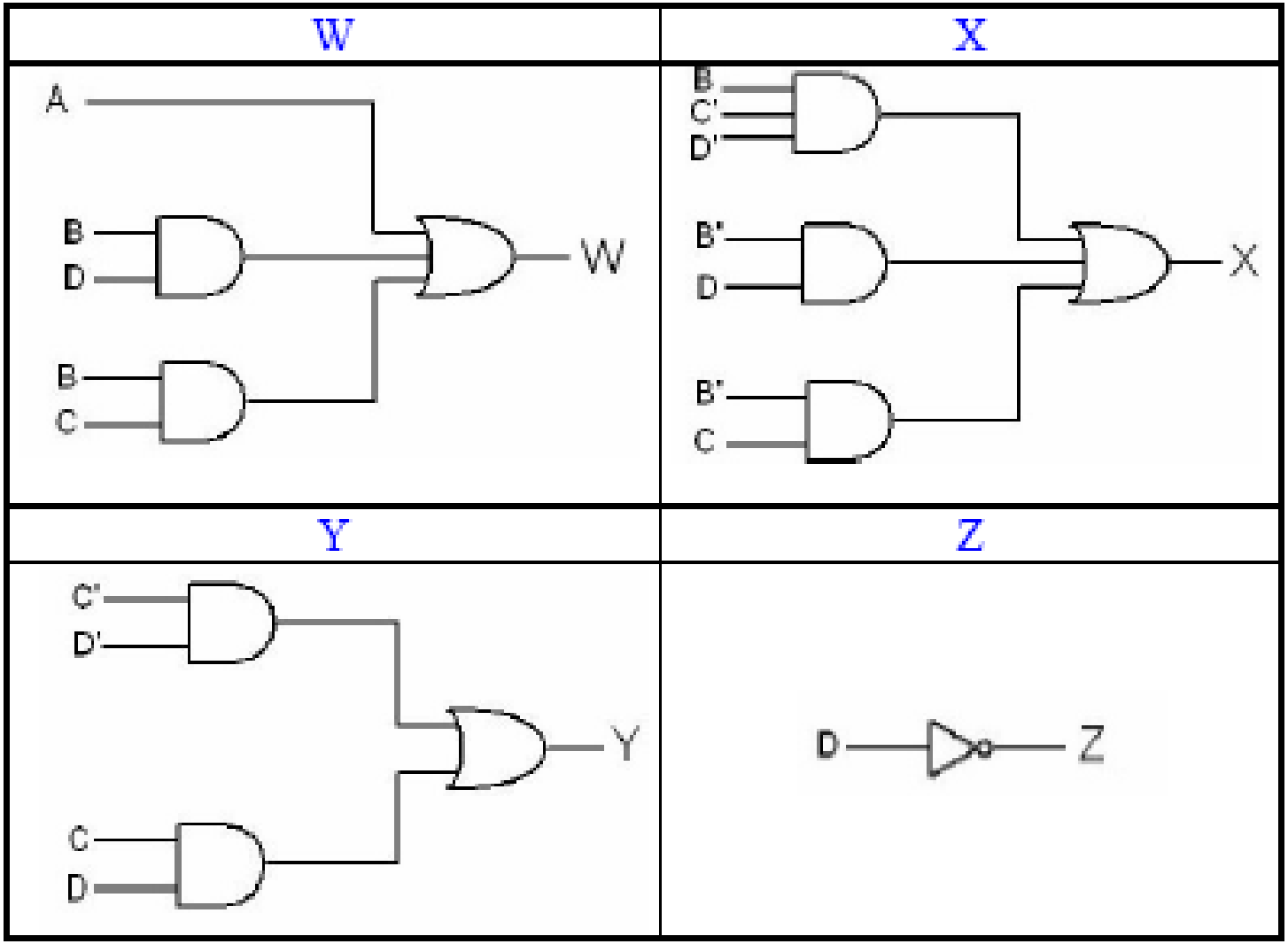


$X = B'C + B'D + BC'D'$



$w = A + BC + BD$

Fig. 4-3 Maps for BCD to Excess-3 Code Converter


W
A
B
D
B
C
W
X
B
C'
D'
B'
D
B'
C
X
Y
C'
D'
C
D
Y
Z
D
Z

BCD to Excess-3 code converter Logic Diagram

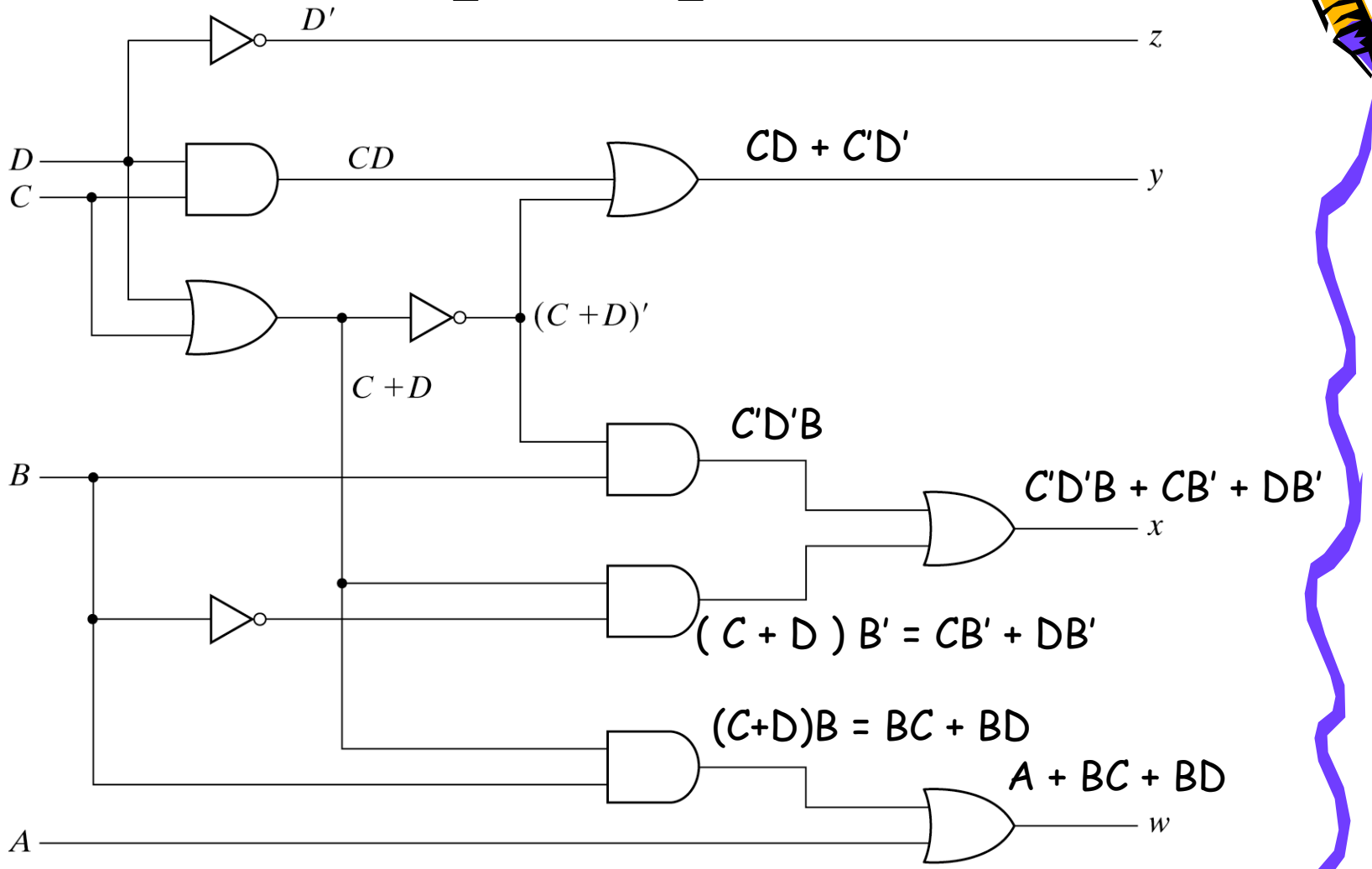
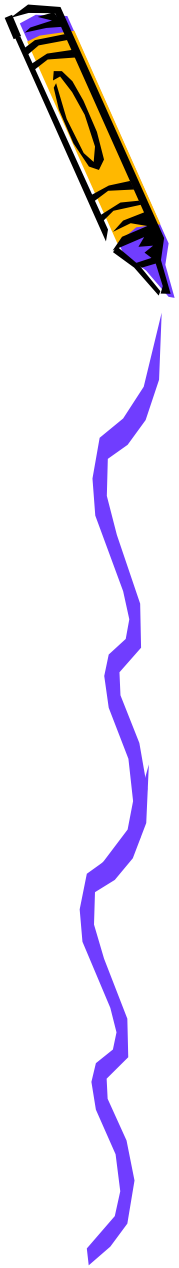


Fig. 4-4 Logic Diagram for BCD to Excess-3 Code Converter



Thank you