



**SNS COLLEGE OF ENGINEERING**

**(Autonomous)**

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**



# Code Converters





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## Excess 3

- It is a non weighted code.
- In XS-3, numbers are represented as decimal digits, and each digit is represented by four bits as the digit value plus 3 (the "excess" amount).
- The primary advantage of XS-3 coding over non-biased coding is that a decimal number can be nines' complemented as easily as a binary number can be ones' complemented . In addition, when the sum of two XS-3 digits is greater than 9, the carry bit of a four bit adder will be set high.





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Decimal	BCD Input				Excess 3 Output			
	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
10-15	All other inputs				X	X	X	X





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$CD$	00	01	11	10
$AB$				
00	0 0	1 0	3 0	2 0
01	4 0	5 1	7 1	6 1
11	12 X	13 X	15 X	14 X
10	8 1	9 1	11 X	10 X

BC → (points to cell 5)

BD → (points to cell 7)

A → (points to cell 14)



## BCD TO EXCESS 3 CODE CONVERTER

• OPTIMIZATION

> USING 16 BLOCK K-MAP

$$W = A + BC + BD$$

$$X = \bar{B}C + \bar{B}D + B\bar{C}\bar{D}$$

$$Y = CD + \bar{C}\bar{D}$$

$$Z = \bar{D}$$

z

	C				
	0	1	2	3	
	1			1	
	1			1	
	X	X	X	X	B
	12	13	15	14	
A	1		X	X	
	0	0	11	10	
	D				

y

	C				
	0	1	2	3	
	1		1		
	1		1		
	X	X	X	X	B
	12	13	15	14	
A	1		X	X	
	0	0	11	10	
	D				

x

	C				
	0	1	2	3	
		1	1	1	
	1				
	X	X	X	X	B
	12	13	15	14	
A		1	X	X	
	0	0	11	10	
	D				

w

	C				
	0	1	2	3	
		1	1	1	
	1				
	X	X	X	X	B
	12	13	15	14	
A	1	1	X	X	
	0	0	11	10	
	D				

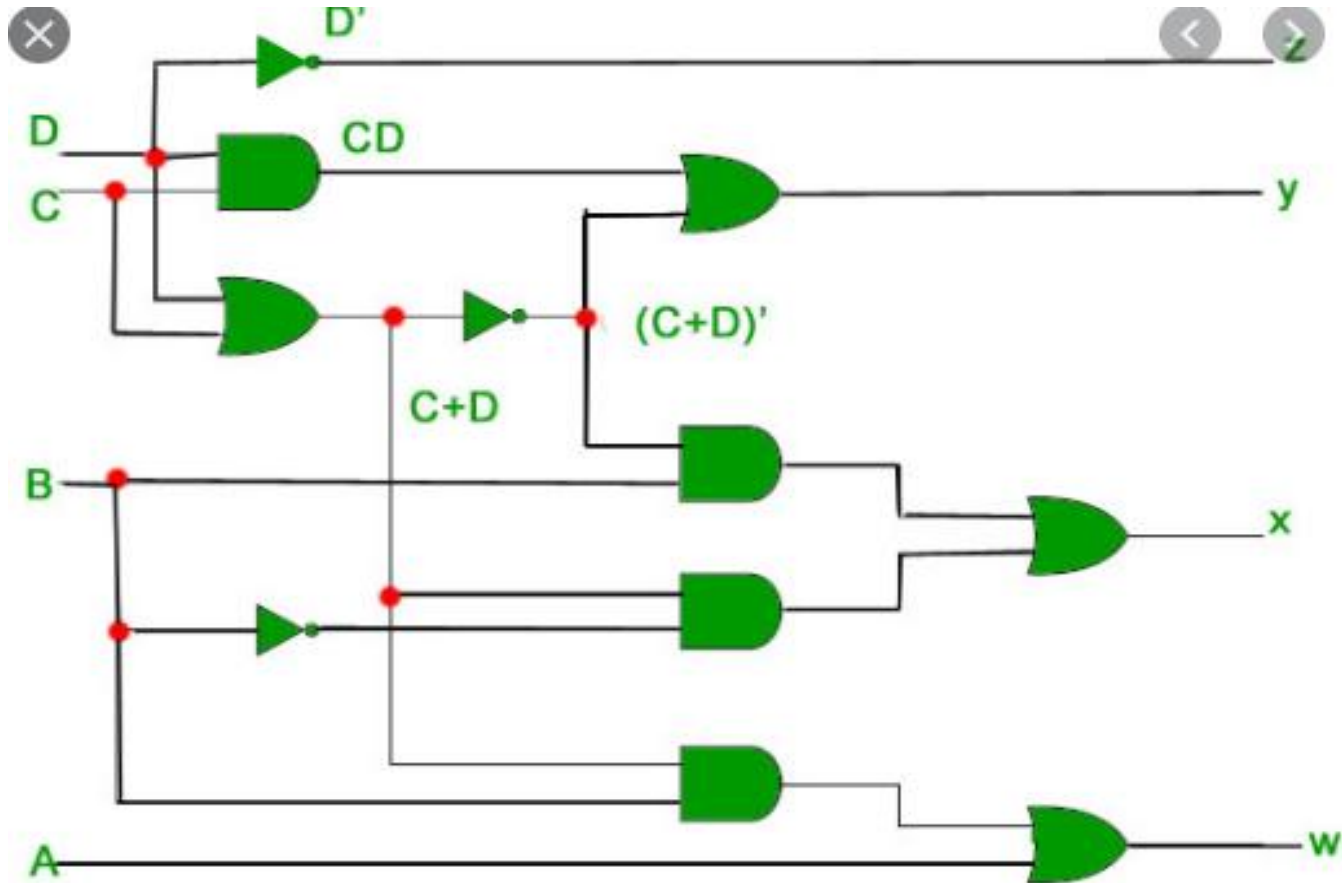




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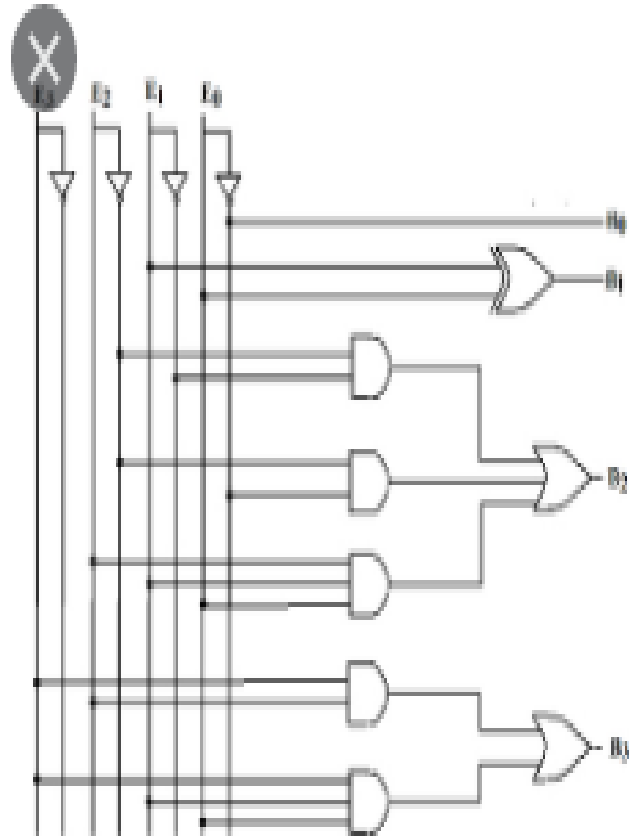
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X	EXCESS-3 INPUT			BCD OUTPUT				
	E3	E2	E1	E0	B3	B2	B1	B0
0	0	0	0	0	X	X	X	X
0	0	0	1	1	X	X	X	X
0	0	1	0	0	X	X	X	X
0	0	1	1	1	0	0	0	0
0	1	0	0	0	0	0	0	1
0	1	0	1	1	0	0	1	0
0	1	1	0	0	0	0	1	1
0	1	1	1	1	0	1	0	0
1	0	0	0	0	0	1	0	1
1	0	0	1	1	0	1	1	0
1	0	1	0	0	0	1	1	1
1	0	1	1	1	1	0	0	0
1	1	0	0	0	1	0	0	1
1	1	0	1	1	X	X	X	X
1	1	1	0	0	X	X	X	X
1	1	1	1	1	X	X	X	X



$E_3 E_2$ $E_3 E_0$	00	01	11	10
00	1	1	X	1
01	0	0	X	0
11	0	0	X	X
10	1	1	X	X

$B_3 = \bar{E}_2$

$E_3 E_2$ $E_3 E_0$	00	01	11	10
00	X	1	0	1
01	X	1	X	1
11	0	0	X	0
10	X	1	X	1

$B_2 = E_2 \oplus E_1$

$E_3 E_2$ $E_3 E_0$	00	01	11	10
00	X	0	0	1
01	X	0	X	1
11	0	1	X	0
10	X	0	X	1

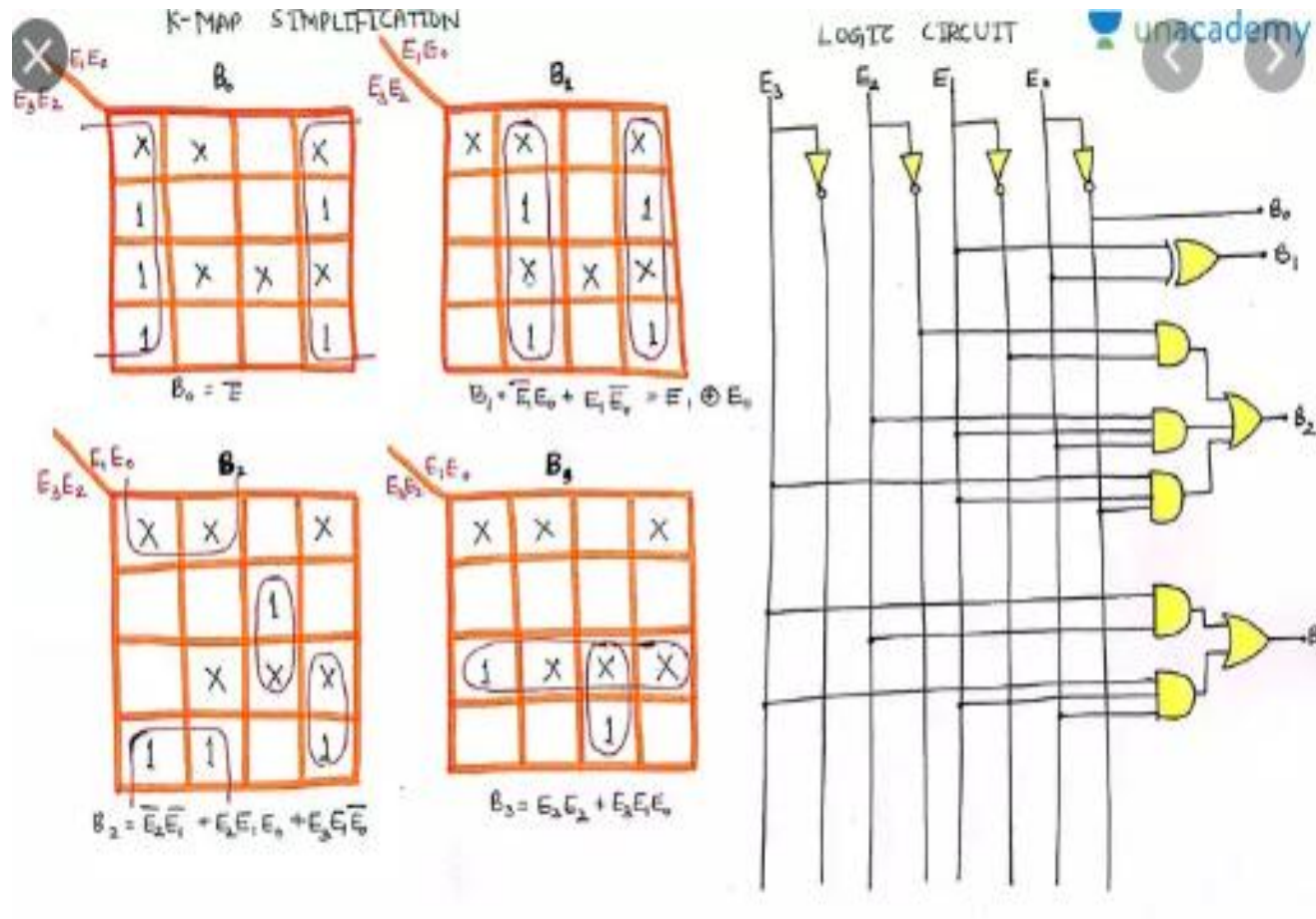
$B_1 = \bar{E}_2 \bar{E}_1 + \bar{E}_2 \bar{E}_0 + E_2 E_1 E_0$

$E_3 E_2$ $E_3 E_0$	00	01	11	10
00	X	0	1	0
01	X	0	X	0
11	0	0	X	1
10	X	0	X	0

$B_0 = E_2 E_1 + E_2 E_0 E_1$









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# THANK YOU

