Circuits in digital

Lecture 23

Combinational circuit	Sequential circuit
o/p depends on Present I/P	o/p depends on present I/P & past o/p

* Combination circuit

- designing of C.C

Step 1: decide input and output line

Step 2: Make Truth table in which each o/p line is shown as f^n of I/P line

Step 3: Minimize the function by K-MAP

Step 4: design ckt by logic gates

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Ex:

* design a combinational ckt which can convert a BCD to x-3 code.

S1 ∘ BCD - binary coded decimal
0 to 9 (Max) 1001 = 4 I/P line

x-3 = BCD + 3 = Max 9+3=12 (1100)

2^4 = 16 Combinations

S2 ∘ Truth table

BCD				x-3			
A	B	C	D	x_1	x_2	x_3	x_4
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

invalid bcd

$X_1 \Rightarrow f(A,B,C,D) = \Sigma m(5,6,7,8,9) + d(10,11 \dots 15)$

$X_2 \Rightarrow f(A,B,C,D) = \Sigma m(1,2,3,4,9) + d(10,11 \dots 15)$

$X_3 \Rightarrow f(A,B,C,D) = \Sigma m(0,3,4,7,8) + d(10,11 \dots 15)$

$X_3 \Rightarrow f(A,B,C,D) = \Sigma m(0,2,4,6,8) + d(10 \dots 15)$

S3 * K-MAP

X1

CD \ AB	00	01	11	10
00		0	X	1
01		1	X	1
11		1	X	X
10		1	X	X

$A + BD + BC$

X2

CD \ AB	00	01	11	10
00		1	X	
01	1		X	1
11	1		X	X
10	1		X	X

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

X3

CD \ AB	00	01	11	10
00	1	1	X	1
01			X	
11	1	1	X	X
10			X	X

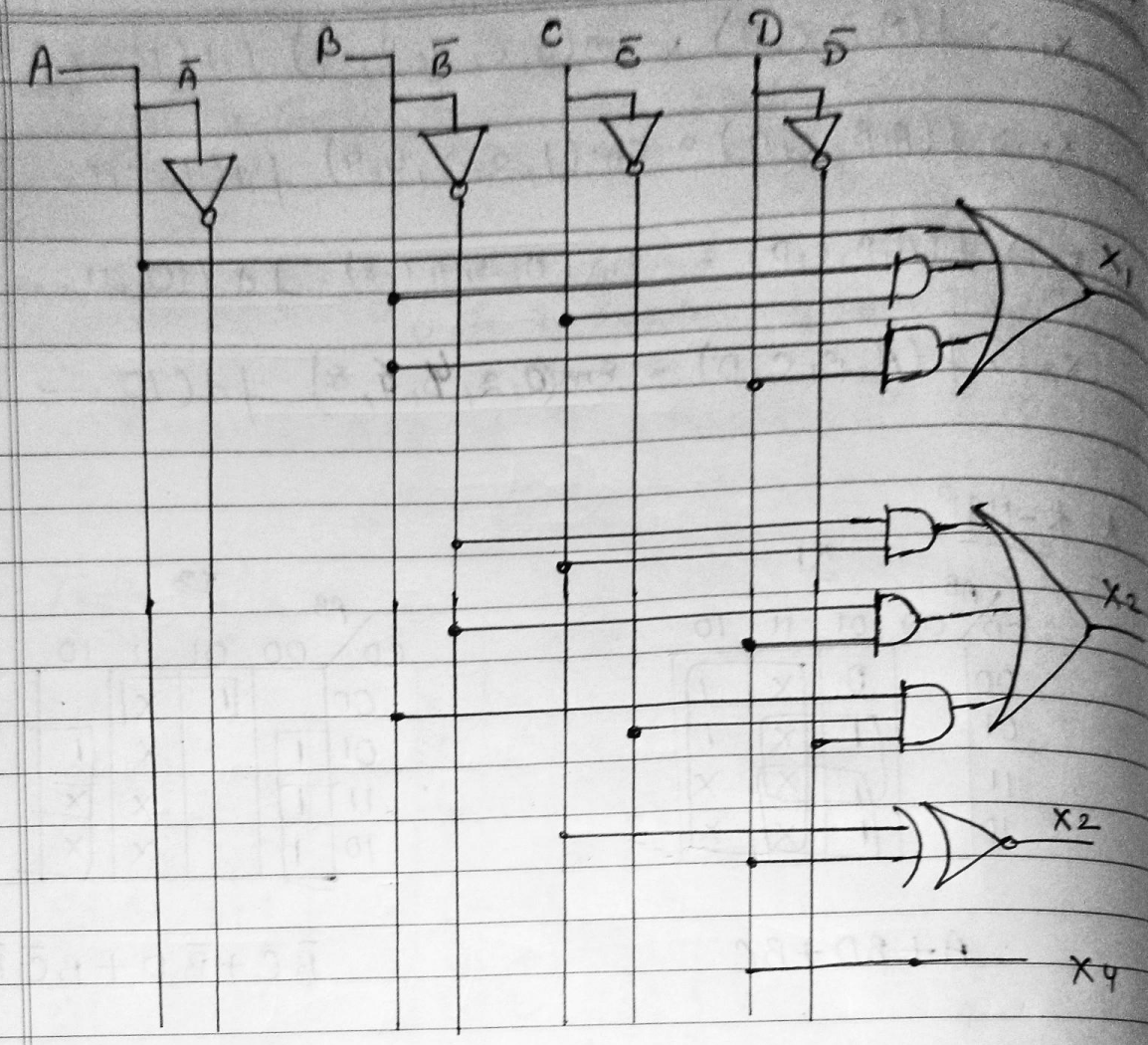
$\bar{C}\bar{D} + CD$

X4

CD \ AB	00	01	11	10
00	1	1	X	1
01			X	
11		0	X	X
10	1	1	X	X

$\bar{D}$

Sy o



BCD to X-3 Code Converter