CMR INSTITUTE OF TECHNOLOGY

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Internal Assesment Test - I

Sub:	**DIGITAL SYSTEM DESIGN**							Code:	15EE35
Date:	20/ 09/ 2017	Duration:	90 mins	Max Marks:	50	Sem:	7th	Branch:	EEE

Answer Any FIVE FULL Questions

		Marks	OBE	
			CO	RBT
1	Design a logic circuit which takes two,2-bit binary numbers as its input and generates an output equal to 1,when sum of two numbers is odd, use K-map to simplify.	10	C305.2	L3
2	Find a minimum SOP solution using Quine-McCluskey method $F(a,b,c,d)=\sum m(1,3,4,5,6,7,10,12,13)+d(2,9,15)$.	10	C305.1	L3
3	Simplify $f(a,b,c,d)=\sum m(2,3,4,5,13,15)+dc(8,9,10,11)$ using MEV technique taking least significant bit as map entered variable.	10	C305.1	L3
4	Implement the function using active low output dual 2:4 decoder line decoder IC 74139 i)$F_1(A,B,C)=\sum m(0,1,2,5)$ ii)$F_2(A,B,C)=\pi M(1,3,4,7)$	10	C305.1	L3
5	Design a priority encoder for a system with a 3 inputs, the middle bit with highest priority encoding to 10,the MSB with next priority encoding to 11,while the LSB with least priority encoding to 01.	10	C305.1	L3
6	Realize the following Boolean function $Y=f(w,x,y,z)=\sum(0,1,5,6,7,10,15)$ using : i) 16 to 1 MUX ii)8:1 MUX iii)4:1 MUX.	10	C305.1	L3

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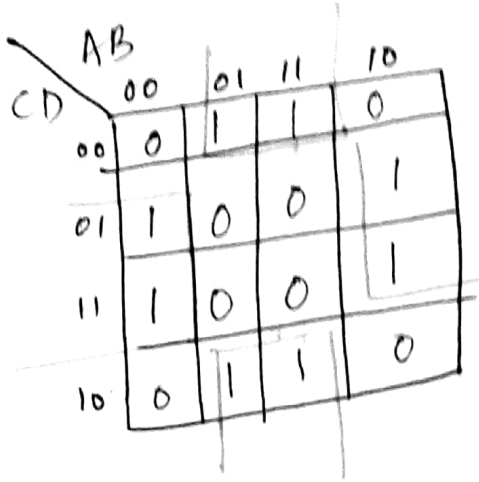
Digital System Design
DAT-1

①

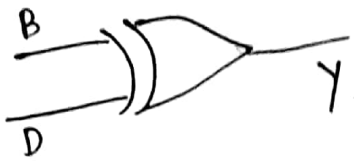
	A	B	C	D	Y
0+0	0	0	0	0	0
0+1	0	0	0	1	1
	0	0	1	0	0
	0	0	1	1	1
	0	1	0	0	1
	0	1	0	1	0
	0	1	1	0	0
	0	1	1	1	0
	1	0	0	0	1
	1	0	0	1	0
	1	0	1	0	1
	1	0	1	1	0
	1	1	0	0	1
	1	1	0	1	0
	1	1	1	0	1
	1	1	1	1	0



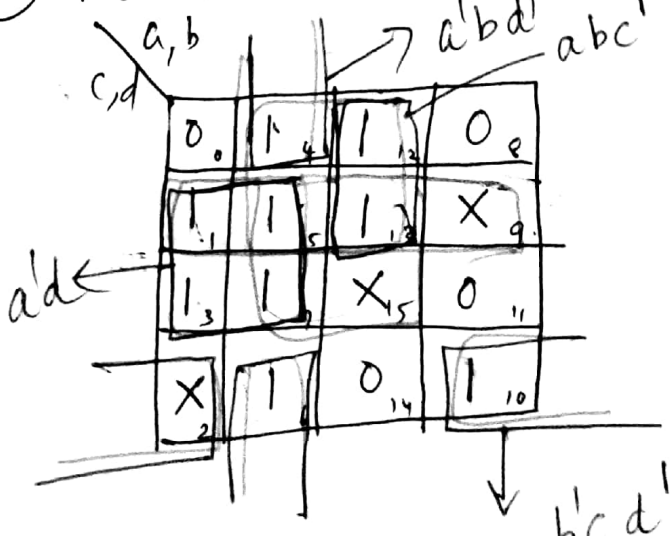
0100
1100
0110
1110
BD'

0001
0011
1001
1011
B'D

$Y = BD' + B'D$



② $F(a,b,c,d) = \Sigma m(1,3,4,5,6,7,10,12,13) + d(2,9,15)$



Minterms	
m_1	0001 ✓
m_2 d_2	0010 ✓
m_3	0011 ✓
m_4	0100 ✓
m_5	0101 ✓
m_6	0110 ✓
m_7	0111 ✓
m_{10} d_9	1001 ✓
m_{12}	1010 ✓
m_{13}	1100 ✓
d_{15}	1101
	1111

m_1	0001 ✓
d_2	0010 ✓
m_4	0100 ✓
m_3	0011 ✓
m_5	0101 ✓
m_6	0110 ✓
d_9	1001 ✓
m_{10}	1010 ✓
m_{12}	1100 ✓
m_7	0111 ✓
m_{13}	1101 ✓
d_{15}	1111 ✓

(1,3) 00-1 ✓
(1,5) 0-01 ✓
(1,9) -001 ✓
(2,3) 001- ✓
(2,6) 0-10 ✓
(2,10) -010

(4,5) 010-
(4,6) 01-0
(4,12) -100

(3,7) 0-11 ✓
(5,7) 01-1 ✓
(6,7) 011- ✓
(9,13) 1-01 ✓

(12,13) 110-

(7,15) -111 ✓
(13,15) 11-1 ✓

(1,3,5,7) 0--1
~~(1,3,6,7)~~
~~(1,5,3,7) 0--1~~

(1,5,9,13) --01
(2,3,6,7) 0-1-
~~(2,6,3,7) 0-1-~~

(5,7,13,15) -1-1

	m_1	d_2	m_3	m_4	m_5	m_6	m_7	d_9	m_{10}	m_{12}	m_{13}	d_{15}
✓ (1,3,5,7)	✓		✓		✓		✓					
(1,5,9,13)	✓				✓			✓			✓	
(2,3,6,7)		✓	✓			✓	✓					
(5,7,13,15)					✓		✓				✓	✓
✓ (2,10)		✓						✓				
(4,5)				✓	✓							
✓ (4,6)				✓		✓						
(4,12)				✓					✓			
✓ (12,13)									✓	✓		

(2,10) — 010 — $b'cd'$

(1,3,5,7) — 0 — — 1 — $a'd$

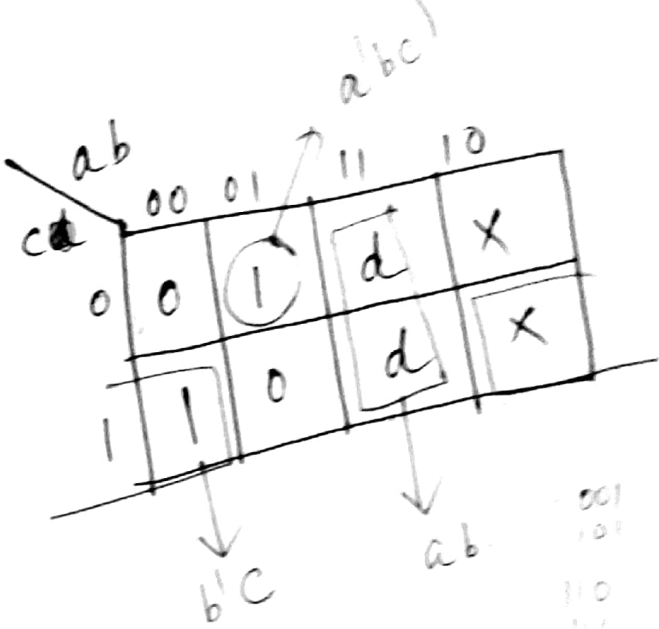
(4,6) — 01 — 0 — $a'bd'$

(12,13) — 11 0 — — abc'

$Y = b'cd' + a'd + a'bd' + abc'$

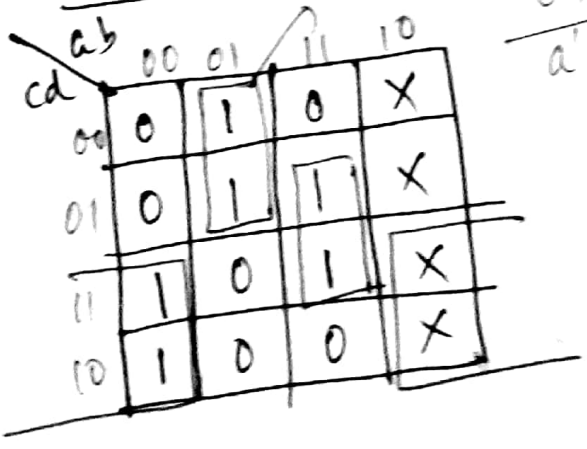
$f(a,b,c,d) = \Sigma M(2,3,4,5,13,15) + d(8,9,10,11)$

a	b	c	d	Y	MEV map entry
0	0	0	0	0	0
0	0	0	1	0	
0	0	1	0	1	1
0	0	1	1	1	
0	1	0	0	1	1
0	1	0	1	1	
0	1	1	0	0	0
0	1	1	1	0	
1	0	0	0	X	X
1	0	0	1	X	
1	0	1	0	X	X
1	0	1	1	X	
1	1	0	0	0	d
1	1	0	1	1	
1	1	1	0	0	d
1	1	1	1	1	



$Y = b'c + abd + a'bc'$

K-map



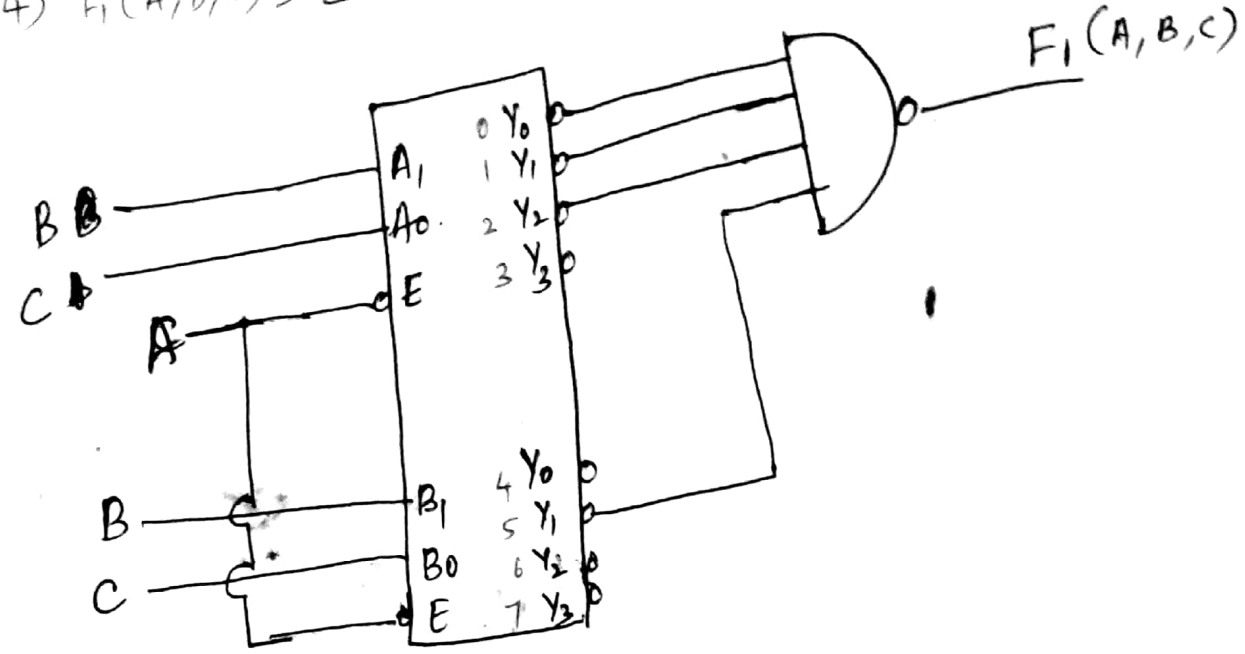
0100
0101
a'bc'

1101
1111
abd.

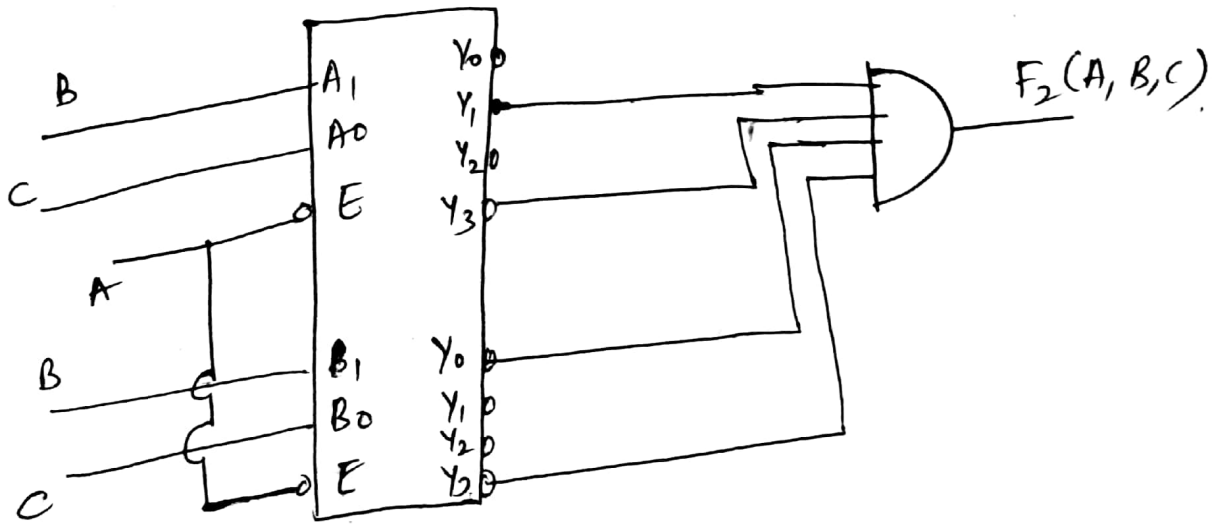
0011
0010
1011
1010
b'c

Verified

(4) (i) $F_1(A,B,C) = \Sigma M(0,1,2,5)$



(ii) $F_2(A,B,C) = \pi M(1,3,4,7)$.

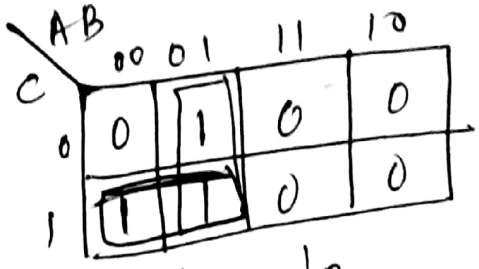


(5)

A	B	C	X	Y
0	0	0	0	0
0	0	1	1	1
0	1	0	1	0
0	1	1	1	0
1	0	0	0	1
1	0	1	0	1
1	1	0	0	1
1	1	1	0	1

$X = \Sigma m(1,2,3)$

$Y = \Sigma m(1,4,5,6,7)$.

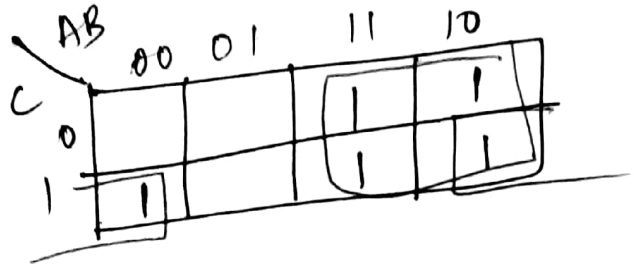


$A'C + A'B$

001
011
$A'C$

110
100
111
101

001
101
$B'C$

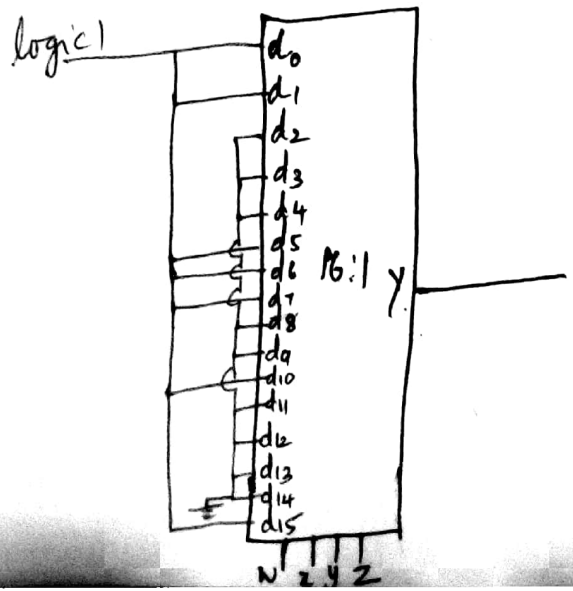


$A + B'C$

circuit

(6) $Y = f(w,x,y,z) = \Sigma(0,1,5,6,7,10,15)$

(i) 16:1 (ii) 8:1 (iii) 4:1

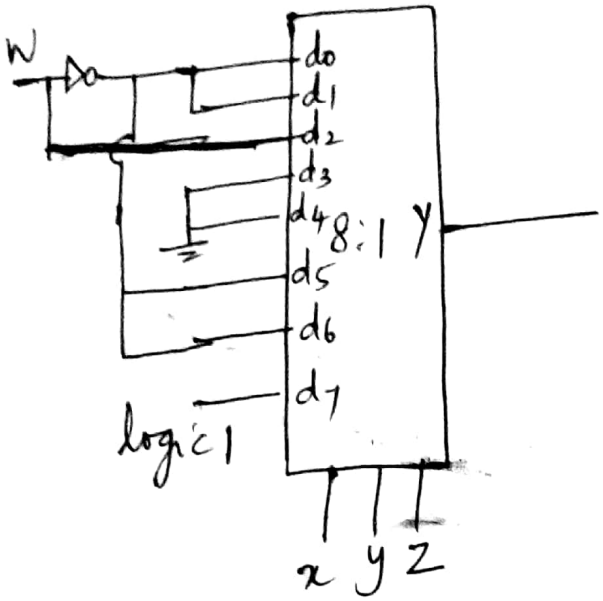


8:1

$\bar{W}$	0	1	2	3	4	5	6	7
W	8	9	10	11	12	13	14	15
	d_0	d_1	d_2	d_3	d_4	d_5	d_6	d_7

$\bar{W}\ \bar{W}\ W\ 0\ 0\ \bar{W}\ \bar{W}\ 1$

8:1



4:1

	d_0	d_1	d_2	d_3
$w'x'$	0	1	2	3
$w'x$	4	5	6	7
wx'	8	9	10	11
wx	12	13	14	15

$w'x'$

$d_1 \rightarrow w'x' + w'x = w'(x'+x)$

$d_2 = w'x + wx'$

$d_3 = w'x + wx = x(w+w')$

$= x$