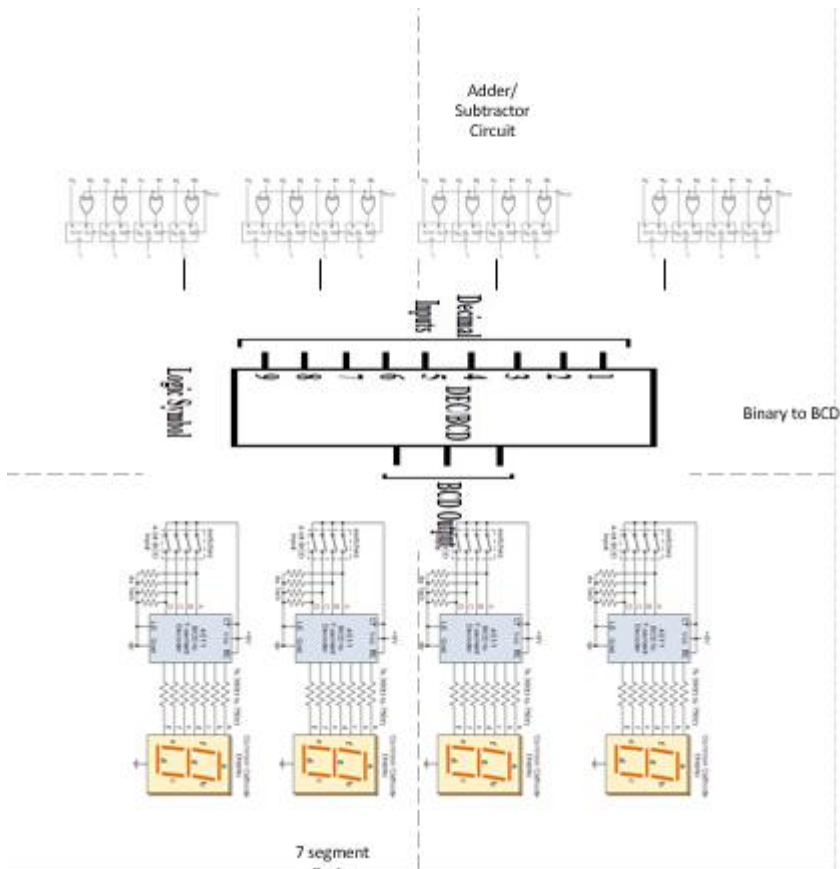| Seat No.	Name	Project Workshop 1:
EP1749096	SHEIKH SAAD HUSSAIN	*Architectural Design of Arithematic Functions* Submitted to: *Sir Hussain Saleem (Assistant Professor / Course Incharge)* *Department of Computer Science, UBIT, University of Karachi.*

Architectural Design of ALU

Workshop

Decimal Digit	BCD Code				Decoding Function
	A_3	A_2	A_1	A_0	$\overline{A_3}\,\overline{A_2}\,\overline{A_1}\,\overline{A_0}$
0					
1	0	0	0	1	"
2	0	0	1	0	"
3	0	0	1	1	"
4	0	1	0	0	"
5	0	1	0	1	"
6	0	1	1	0	"
7	0	1	1	1	"
8	1	0	0	0	"
9	1	0	0	1	"

Dec.   Inputs.   Outputs.

Dec	Inputs	Outputs
0	0000	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1	0001	1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1
2	0010	1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1
3	0011	1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1
4	0100	1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1
5	0101	1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1
6	0110	1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1
7	0111	1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1
8	1000	1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1
9	1001	1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1
10	1010	1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1
11	1011	1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1
12	1100	1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1
13	1101	1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1
14	1110	1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1
15	1111	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0

0 0 0 00   0 0 0 0 0   0 0 0 1 1   1 0 0 0 0

8 4 2 1   8 4 2 1   8 4 2 1   8 4 2 1

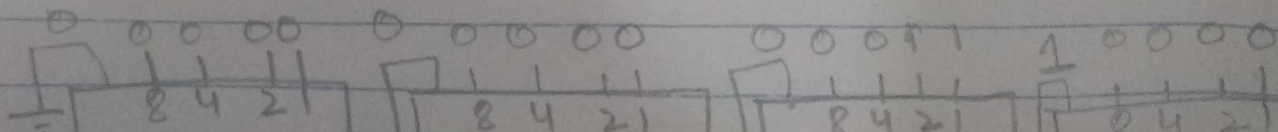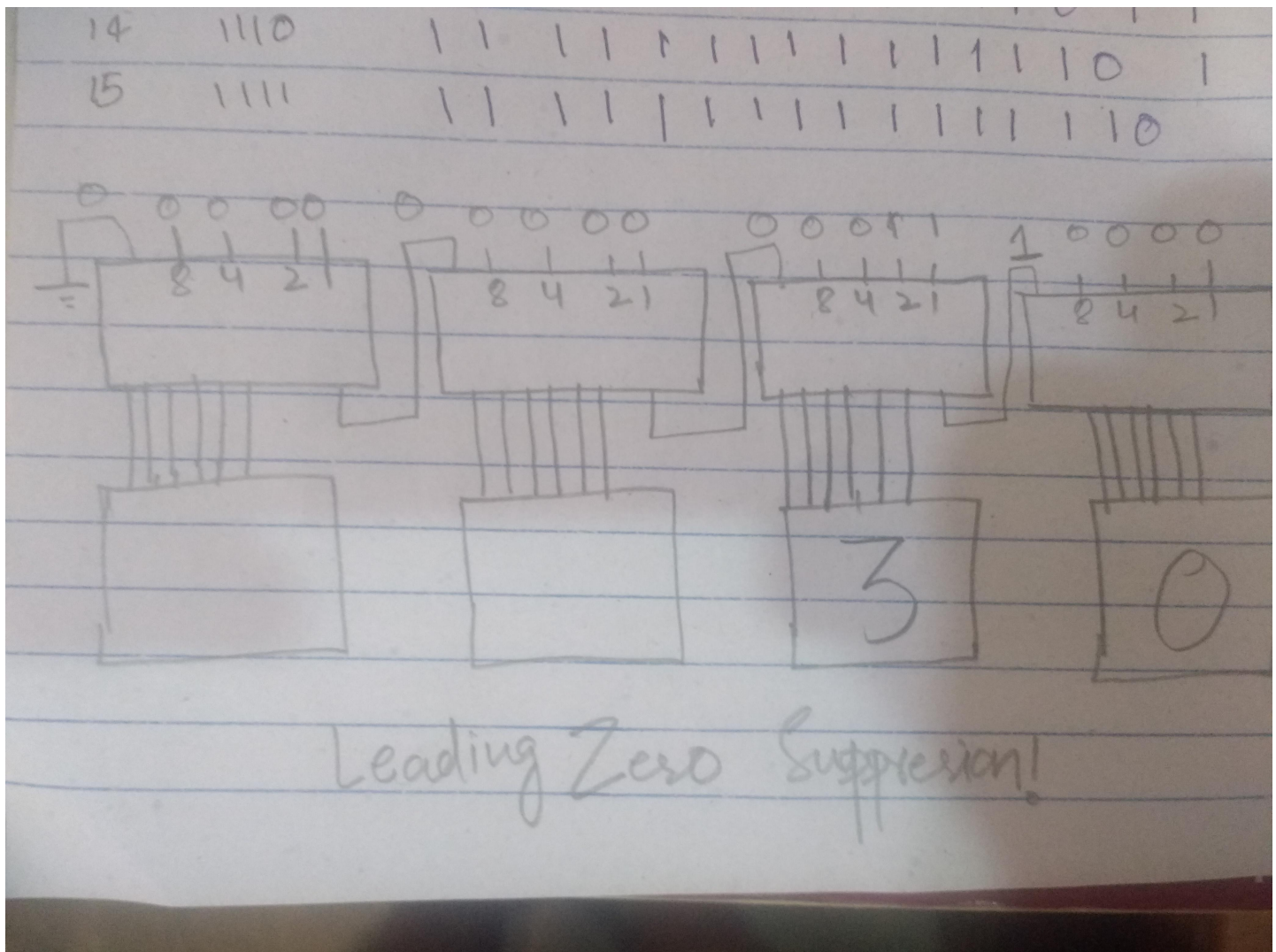| Seat No.	Name	Project Workshop 1:
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14 1110 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1

15 1111 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0

8 4 2 1   8 4 2 1   8 4 2 1   8 4 2 1

3   0

Leading Zero Suppresion!

Seat No.	Name	Project Workshop 1:
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Karnaugh Maps

Seat No.	Name	Project Workshop 1:
EP1749096	SHEIKH SAAD HUSSAIN	*Architectural Design of Arithematic Functions*

Project Workshop 1:
Architectural Design of Arithematic Functions
Submitted to:
Sir Hussain Saleem (Assistant Professor / Course Incharge)
Department of Computer Science, UBIT, University of Karachi.

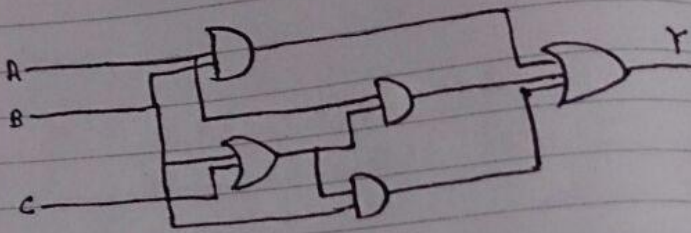| Seat No.	Name	*Project Workshop 1:*
		Architectural Design of Arithematic Functions
EP1749096	**SHEIKH SAAD HUSSAIN**	*Submitted to:* *Sir Hussain Saleem (Assistant Professor / Course Incharge)* *Department of Computer Science, UBIT, University of Karachi.*

Pg # 01

Q1:- Fig # 01

$$Y = AB + A(B+C) + B(B+C)$$
$$Y = AB + AB + AC + BB + BC$$
$$= AB + AC + B + BC$$
$$= AB(C+\bar{C}) + A(B+\bar{B})C + B(A+\bar{A})(C+\bar{C})+BC$$
$$\Rightarrow Y = ABC + AB\bar{C} + (AB + A\bar{B})C + (AB+\bar{A}\bar{B})(C+\bar{C})+ABC$$
$$\Rightarrow Y = ABC + AB\bar{C} + ABC + A\bar{B}C + ABC + \bar{A}B\bar{C} + ABC +$$
$$\Rightarrow Y = ABC + AB\bar{C} + A\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC$$

Y	$\bar{B}\bar{C}$	$\bar{B}C$	B$\bar{C}$	B$\bar{C}$
$\bar{A}$			1	1
A		1	1	1

Q2:-

A ——
B ——
C ——
D ——

Y =
Y =
Y =
Y
Y
Y
Y
Y

Y

Y

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pg # 02

Q2 :- fig # 02
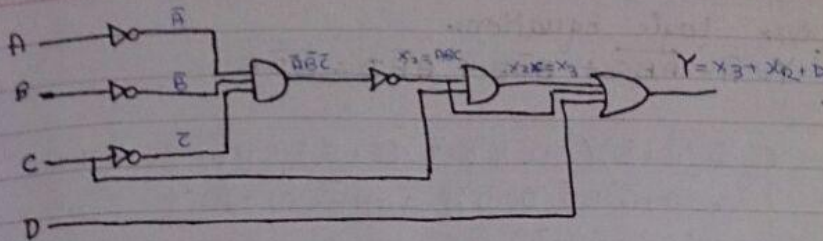
$$Y = x_3 + x_2 + D$$

$$\Rightarrow Y = (x_2 \cdot C) + ABC + D$$

$$Y = (ABC \cdot C) + ABC + D$$

$$Y = ABC + ABC + D$$

$$Y = ABC + D$$

$$Y = ABC(D + \bar{D}) + (A + \bar{A})(B + \bar{B})(C + \bar{C})D$$

$$Y = ABCD + ABC\bar{D} + [(AB + A\bar{B} + \bar{A}B + \bar{A}\bar{B})(C + \bar{C})]D$$

$$Y = ABCD + ABC\bar{D} + (ABC + A\bar{B}C + \bar{A}BC + \bar{A}\bar{B}C + AB\bar{C} + A\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}\bar{C})D$$

$$Y = ABCD + ABC\bar{D} + A\bar{B}CD + \bar{A}BCD + \bar{A}\bar{B}CD$$
$$+ AB\bar{C}D + A\bar{B}\bar{C}D + \bar{A}B\bar{C}D + \bar{A}\bar{B}\bar{C}D$$

$$Y = ABCD + ABC\bar{D} + A\bar{B}CD + \bar{A}BC\bar{D} + \bar{A}\bar{B}CD + AB\bar{C}D$$
$$+ A\bar{B}\bar{C}D + \bar{A}B\bar{C}D + \bar{A}\bar{B}\bar{C}D$$

pg # 03

Q3: Logic Equation:-

$$Y = \overline{A} + \overline{ABC} + B\overline{C}E + A\overline{B}D + \overline{C}DE$$

Sol:

$$\Rightarrow Y = \overline{A}(B+\overline{B})(C+\overline{C})(D+\overline{D})(E+\overline{E}) + \overline{ABC}(D+\overline{D})(E+\overline{E})$$
$$+ (A+\overline{A})B\overline{C}(D+\overline{D})E + A\overline{B}(C+\overline{C})D(E+\overline{E}) +$$
$$(A+\overline{A})(B+\overline{B})\overline{C}DE$$

$$\Rightarrow Y = A(B+\overline{B})(C+\overline{C})(DE + D\overline{E} + \overline{D}E + \overline{D}\,\overline{E}) + \overline{A}\,\overline{B}\,\overline{C}\,(DE +$$
$$D\overline{E} + \overline{D}E + \overline{D}\,\overline{E}) + (AB\overline{C} + \overline{A}B\overline{C})(DE + \overline{D}E) +$$
$$(A\overline{B}C + A\overline{B}\overline{C})(DE + D\overline{E}) + (AB + A\overline{B} + \overline{A}B + \overline{A}\,\overline{B})\overline{C}DE$$

$$\Rightarrow Y = \cancel{A(B} A(B+\overline{B})(CDE + CD\overline{E} + C\overline{D}E + C\overline{D}\,\overline{E} + \overline{C}DE$$
$$+ \overline{C}D\overline{E} + \overline{C}\,\overline{D}E + \overline{D}\,\overline{C}E) + \overline{A}\,\overline{B}\,\overline{C}DE + \overline{A}\,\overline{B}\,\overline{C}D\overline{E}$$
$$+ \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}E + \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}\,\overline{E} + AB\overline{C}DE + AB\overline{C}\,\overline{D}E +$$
$$\overline{A}B\overline{C}DE + \overline{A}B\overline{C}\,\overline{D}E + A\overline{B}CDE + A\overline{B}CD\overline{E} -$$
$$A\overline{B}\,\overline{C}DE + A\overline{B}\,\overline{C}D\overline{E} + AB\overline{C}DE + AB\overline{C}\,\overline{D}E + \overline{A}B\overline{C}$$
$$+ A\overline{B}\,\overline{C}DE$$

$$\Rightarrow Y = A(BCDE + BCD\overline{E} + BC\overline{D}E + BC\overline{D}\,\overline{E} + B\overline{C}DE +$$
$$B\overline{C}D\overline{E} + B\overline{C}\,\overline{D}E + B\overline{C}\,\overline{D}\,\overline{E} + \overline{B}CDE + \overline{B}CD\overline{E} +$$
$$\overline{B}C\overline{D}E + \overline{B}C\overline{D}\overline{E} + \overline{B}\,\overline{C}DE + \overline{B}\,\overline{C}D\overline{E} + \overline{B}\,\overline{C}\,\overline{D}E +$$
$$\overline{B}\,\overline{C}\,\overline{D}\,\overline{E}) + \overline{A}\,\overline{B}\,\overline{C}DE + \overline{A}\,\overline{B}\,\overline{C}D\overline{E} + \overline{A}\,\overline{B}\,\overline{C}\,\overline{D}E +$$
$$\overline{A}\,\overline{B}\,\overline{C}\,\overline{D}\,\overline{E} + AB\overline{C}DE + AB\overline{C}\,\overline{D}E + \overline{A}B\overline{C}DE +$$
$$\overline{A}B\overline{C}\,\overline{D}E + A\overline{B}CDE + A\overline{B}CD\overline{E} + A\overline{B}\,\overline{C}DE +$$
$$A\overline{B}\,\overline{C}D\overline{E} + AB\overline{C}DE + AB\overline{C}\,\overline{D}E + \overline{A}B\overline{C}\,\overline{D}E +$$
$$\overline{A}B\overline{C}\,\overline{D}E$$

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pg # 04

$\Rightarrow Y = ABCDE + AB\acute{C}D\bar{E} + AB\acute{C}\bar{D}E + A'BC\bar{D}\bar{E} + AB\bar{C}D\acute{E}$
$+ A\bar{B}\bar{C}D\bar{E} + A\bar{B}\bar{C}\bar{D}E + AB\acute{C}\bar{D}\bar{E} + A\bar{B}CDE + A\bar{B}CD\bar{E}$
$+ A\bar{B}C\bar{D}E + ABC\bar{D}E + A\bar{B}\bar{C}DE + AB\bar{C}\bar{D}E +$
$A\bar{B}\bar{C}\bar{D}E + A\bar{B}\acute{C}\bar{D}\bar{E} + \bar{A}B\bar{C}DE + \bar{A}\bar{B}C DE + \bar{A}\bar{B}C\bar{D}E$
$+ \bar{A}\bar{B}C\bar{D}E + ABCD\bar{E} + A\bar{B}\bar{C}DE + AB\bar{C}DE + AB\bar{C}DE$
$+ A\bar{B}\bar{C}D E + \bar{A}BC\bar{D}E + \bar{A}B\bar{C}\bar{D}E$

$\Rightarrow Y = ABCDE + ABCD\bar{E} + AB\acute{C}\bar{D}E + ABC\bar{D}\bar{E} + AB\bar{C}DE +$
$AB\bar{C}D E + AB\bar{C}\bar{D}E + AB\bar{C}\bar{D}\bar{E} + A\bar{B}CDE + A\bar{B}CD\bar{E} +$
$A\bar{B}C\bar{D}E + A\bar{B}C\bar{D}\bar{E} + A\bar{B}\bar{C}DE + A\bar{B}\bar{C}D\bar{E} + A\bar{B}\bar{C}\bar{D}E +$
$A\bar{B}\bar{C}\bar{D}\bar{E} + \bar{A}BCDE + \bar{A}BC\bar{D}\bar{E} + \bar{A}B\bar{C}\bar{D}E + \bar{A}B\bar{C}D E +$
$\bar{A}B\bar{C}\bar{D}E$

| Y \ CDE | 000 | 001 | 011 | 010 | 110 | 111 | 101 | 100 |
AB								
00		1	1	1				
01		1						
11	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1

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Pg # 05

Table Set 1

Q4:

	A	B	C	D	E	OFF (0)	ON (1)	X	Y
						1			0
0	0	0	0	0	0		1		1
1	0	0	0	0	1		1		1
2	0	0	0	1	0		1		1
3	0	0	0	1	1		1		0
4	0	0	1	0	0	1			1
5	0	0	1	0	1		1		1
6	0	0	1	1	0		1		1
7	0	0	1	1	1		1		0
8	0	1	0	0	0	1			0
9	0	1	0	0	1	1			0
10	0	1	0	1	0	1			1
11	0	1	0	1	1		1		0
12	0	1	1	0	0	1			1
13	0	1	1	0	1		1		1
14	0	1	1	1	0		1		0
15	0	1	1	1	1	1			0
16	1	0	0	0	0	1			1
17	1	0	0	0	1		1		1
18	1	0	0	1	0		1		1
19	1	0	0	1	1		1		1
20	1	0	1	0	0	1			0
21	1	0	1	0	1	1			0
22	1	0	1	1	0	1			0
23	1	0	1	1	1		1		1
24	1	1	0	0	0		1		0

Pg # 06

25	1	1	0	0	1	1			0	
26	1	1	0	1	0	1			0	
27	1	1	0	1	1			1		1
28	1	1	1	0	0			1		1
29	1	1	1	0	1			1		1
30	1	1	1	1	0	1			0	
31	1	1	1	1	1	1			0	

CDE AB	000	001	011	010	110	111	101	100
00		1	1	1	1	1	1	
01			1		1		1	
11			1				1	1
10		1	1	1	1			

Pg # 07

Qs   Table set 2

idx	A	B	C	D	E	F	O	i	x	Y
0	0	0	0	0	0	0	0	1		0
1	0	0	0	0	0	1	1	1		0
2	0	0	0	0	1	0		1		1
3	0	0	0	0	1	1	0			0
4	0	0	0	1	0	0		1		1
5	0	0	0	1	0	1		1		0
6	0	0	0	1	1	0	0	1	x	
7	0	0	0	1	1	1				1
8	0	0	1	0	0	0		1	x	
9	0	0	1	0	0	1		1		1
10	0	0	1	0	1	0		1		1
11	0	0	1	0	1	1		1		1
12	0	0	1	1	0	1	1			0
13	0	0	1	1	0	1	0	1		1
14	0	0	1	1	1	0		1		1
15	0	0	1	1	1	1		1		1
16	0	1	0	0	0	0		1		0
17	0	1	0	0	0	1	1			1
18	0	1	0	0	1	0		1		1
19	0	1	0	0	1	1		1		1
20	0	1	0	1	0	0	1			0
21	0	1	0	1	0	1		1		0
22	0	1	0	1	1	0		1		0
23	0	1	0	1	1	1		1		1

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Pg # 08

	A	B	C	D	E	F	D	i	x	Y
24	0	1	1	0	0	0			1	x
25	0	1	1	0	0	1	1			0
26	0	1	1	0	1	0	1			0
27	0	1	1	0	1	1		1		1
28	0	1	1	1	0	0		1		1
29	0	1	1	1	0	1		1		1
30	0	1	1	1	1	0	1			0
31	0	1	1	1	1	1	1			0
32	1	0	0	0	0	0	1			0
33	1	0	0	0	0	1		1		1
34	1	0	0	0	1	0		1		1
35	1	0	0	0	1	1		1		1
36	1	0	0	1	0	0			1	x
37	1	0	0	1	0	1			1	x
38	1	0	0	1	1	0	1			0
39	1	0	0	1	1	1		1		1
40	1	0	1	0	0	0	1			0
41	1	0	1	0	0	1		1		1
42	1	0	1	0	1	0	1			0
43	1	0	1	0	1	1		1		1
44	1	0	1	1	0	0	1			0
45	1	0	1	1	0	1	1			0
46	1	0	1	1	1	0		1		1
47	1	0	1	1	1	1		1		1
48	1	1		0	0	0		1		0
49	1	1		0	0	0	1	1		

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Pg # 09

	A	B	C	D	E	F	O	i	x	Y
	1	1	0	0	1	0	1		●	0
S0	1	1	0	0	1	1	1			0
S1	1	1	0	0	1	0		1		1
S2	1	1	0	1	0	0		1		1
S3	1	1	0	1	0	1		1		1
S4	1	1	0	1	1	0		1		1
S5	1	1	0	1	1	1		1		0
S6	1	1	1	0	0	0	1			x
S7	1	1	1	0	0	1			1	0
S8	1	1	1	0	1	0	1			1
S9	1	1	1	0	1	1		1		1
60	1	1	1	1	0	0		1		0
61	1	1	1	1	0	1	1		1	1
62	1	1	1	1	1	0		1	1	1
63	1	1	1	1	1	1			1	
	–	–	–	–	–	–	–	–	–	–

ABC \ DEF	000	001	011	010	100	101	111	110
000			1		1	1	x	
001	1	x	1	1	1		1	1
011	x		1			1	1	
010	1		1		1			1
100		1	1	1	x	x	1	
101		1	1				1	
111		x	1		1		1	1
110	1				1	1	1	1

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