DIGITAL ELECTRONICS

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Q1 i) Truth Table:

Inputs			Outputs	
A	B	Bin	Bout (Borrow)	D (Difference)
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	0
1	0	0	0	1
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

ii) For D:

	$\bar{B}\bar{B}in$	$\bar{B}Bin$	$BBin$	$B\bar{B}in$
$\bar{A}$		1		1
A	1		1	

$D = \bar{A}\bar{B}Bin + \bar{A}B\bar{B}in + A\bar{B}\bar{B}in + ABBin$

iii) For Bout

	$\bar{B}\bar{B}in$	$\bar{B}Bin$	$BBin$	$BBin$
$\bar{A}$		1	1	1
A			1	

$Bout = \bar{A}Bin + \bar{A}B + BBin$

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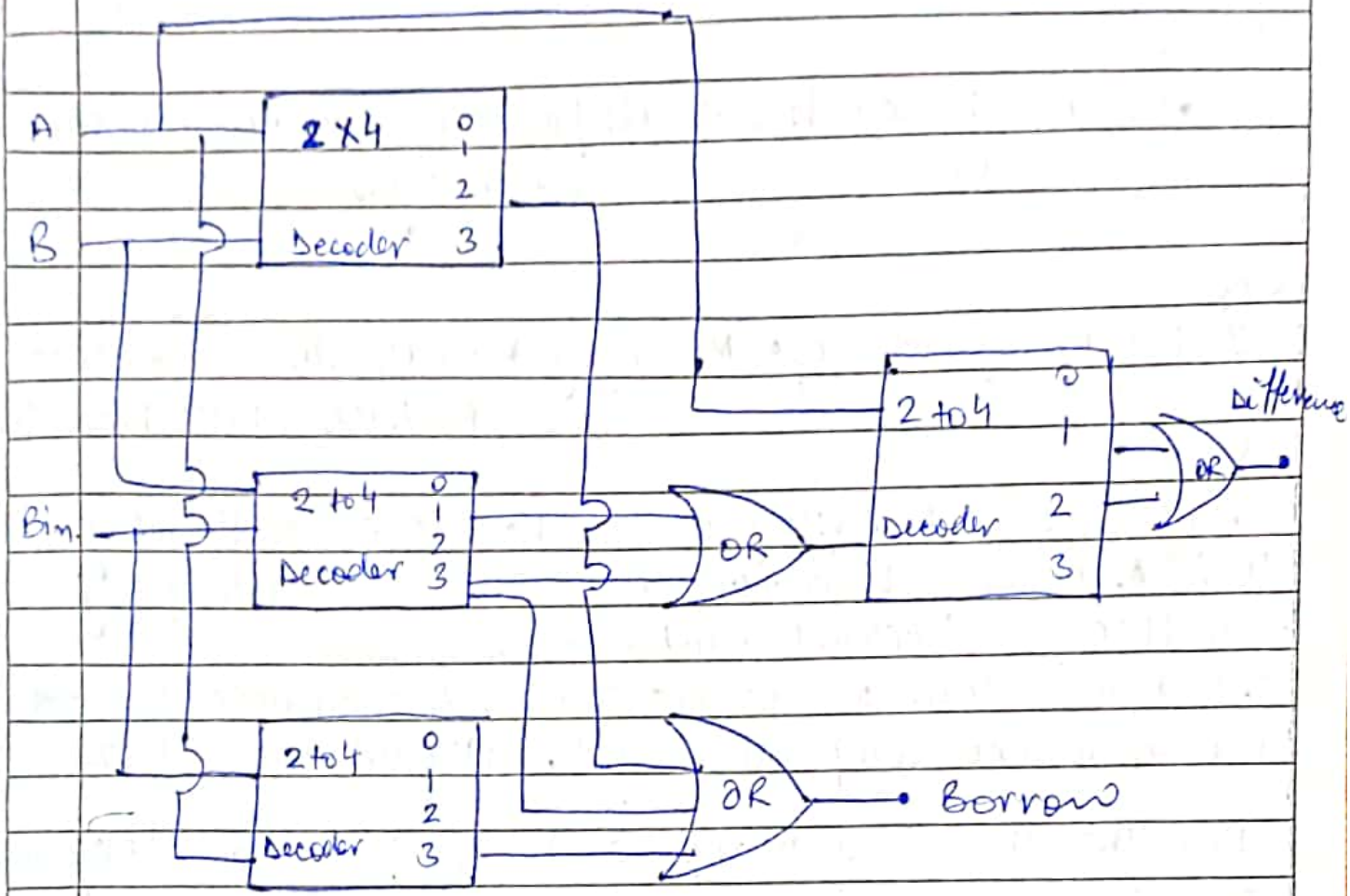

When 0 gives $\bar{A}\bar{B}$, 1 gives $\bar{A}B$, 2 gives $A\bar{B}$, 3 gives AB if A and B are inputs.

Ans2 a) Using MB as select $[(A,B,C) = \Sigma m(0,1,3,5,6,7)]$

A	B	C	f
0	0	0	C'
0	0	1	C
0	1	0	C'
0	1	1	C
1	0	0	C'
1	0	1	C
1	1	0	C'
1	1	1	C

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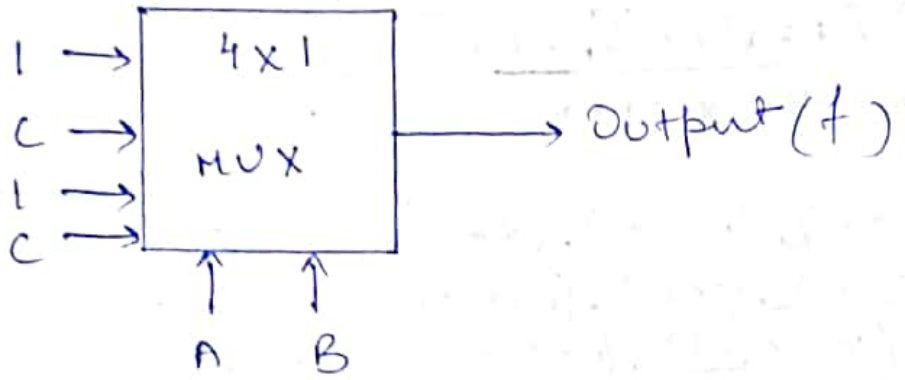
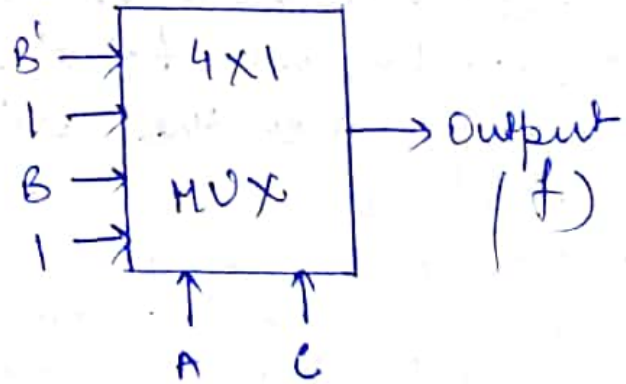
	I_0	I_1	I_2	I_3
C'	0	2	4	6
C	1	3	5	7



b) Using BC as selecting line

A	B	C	f
0	0	0	B'
0	0	1	B'
0	1	0	B
0	1	1	B
1	0	0	B'
1	0	1	B'
1	1	0	B
1	1	1	B

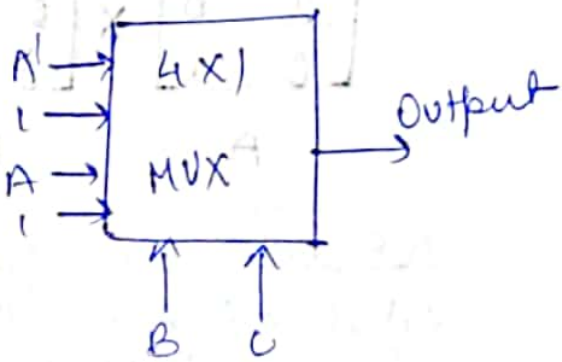
	I_0	I_1	I_2	I_3
B'	0	1	4	5
B	2	3	6	7
	B'	1	B	1



c) Using BC as selected line.

A	B	C	f
0	0	0	A'
0	0	1	A'
0	1	0	A'
0	1	1	A'
1	0	0	A
1	0	1	A
1	1	0	A
1	1	1	A

	I_0	I_1	I_2	I_3
A'	0	1	2	3
A	4	5	6	7



Ans3 a) Octal to Binary : 1204743

1) Octal to Decimal

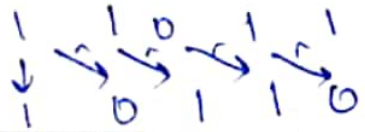
$1\times8^6 + 2\times8^5 + 0\times8^4 + 4\times8^3 + 7\times8^2 + 4\times8^1 + 3\times8^0$

$= (330211)_{10}$

2) Binary from Decimal

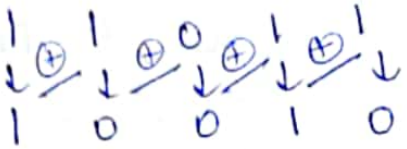
$(101000001\ 001111\ 00011)_2$

b) Binary to Gray 11011



$= (10110)$

c) Gray to Binary : 11011



$= (10010)$

d) Binary to excess 3 code: 10010111

1) Binary to Decimal

$= 2^7 + 2^4 + 2^2 + 2^1 + 2^0$

$= 151$

2) Adding 3 in each digit

$= 151 + 333$

$= 484$

3) Binary code of each digit

$(0100)_2 \ (1000)_2 \ (0100)_2$

$= 010010000100$

e) Performing BCD addition of 365 & 784

1) sum of 367 and 784 = 1149

2) Binary representation of each digit.

(0001 0001 0100 1001)

f) 1) (−14) − 36

2) (−14) − (−36)

3) 2's complement of +14

$(14)_{10} = (1110)_2$

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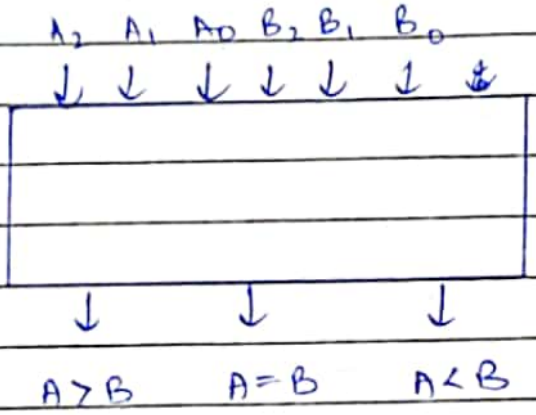
2's complement of 1110 is 0010

2's complement of 36

$(36)_{10} = (100100)_2$

2's complement of $100100 = 011100$

Ans 4



1) $A = B$

$(A_0 B_0 + \bar{A_0} \bar{B_0})(\bar{A_1} \bar{B_1} + A_1 B_1)(A_2 B_2 \bar{A_2} \bar{B_2})$

2) $A > B$

if $A_2 > B_2$

if $A_2 = B_2$ then $A_1 > B_1$

if $A_2 = B_2$ and $A_1 = B_1$ then $A_0 > B_0$

so $A > B =$

$A_2 \bar{B_2} + [(A_2 B_2 + \bar{A_2} \bar{B_2}) \times (A_1 \bar{B_1})] + [(A_2 B_2 + \bar{A_2} \bar{B_2}) \times (A_1 B_1 + \bar{A_1} \bar{B_1}) \times (A_2 B_2 + \bar{A_2} \bar{B_2}) \times A_0 \bar{B_0})]$

3) Similarly $B > A$

$\bar{A_2} B_2 + [(A_2 B_2 + \bar{A_2} \bar{B_2}) \times (\bar{A_1} B_1)] + [(A_2 B_2 + \bar{B_2} \bar{A_2}) \times (\bar{A_1} \bar{B_1} + A_1 B_1) \times (\bar{A_0} B_0)]$

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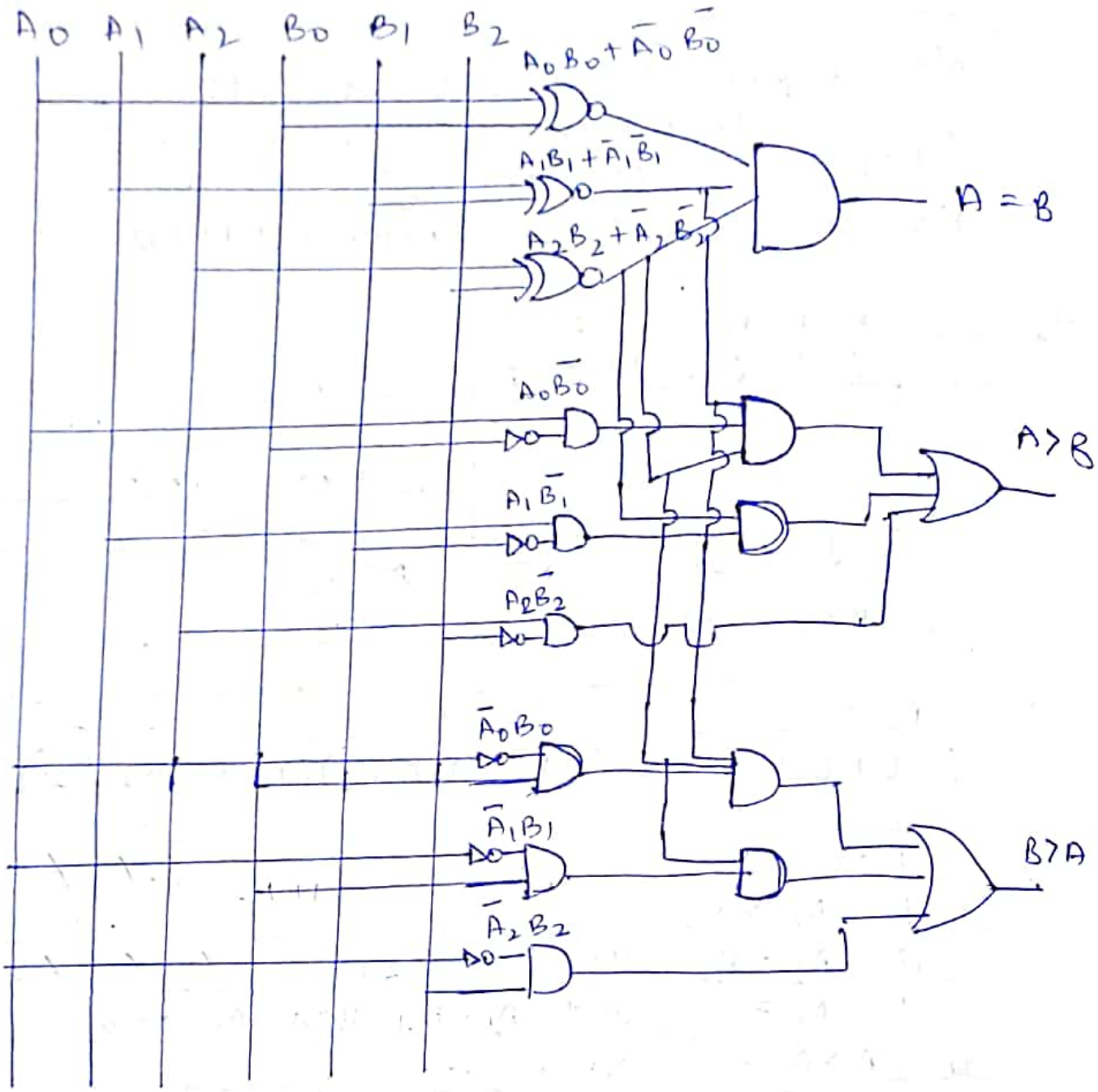
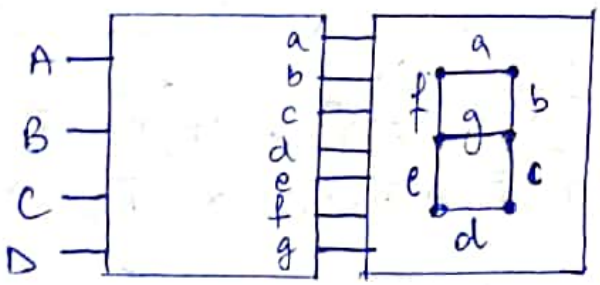


Ques5 BCD to 7-segment decoder



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Truth Table

A	B	C	D	a	b	c	d	e	f	g
0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	0	1	1	0	0	0	0
0	0	1	0	1	1	0	1	1	0	1
0	0	1	1	1	1	1	1	0	0	1
0	1	0	0	0	1	1	0	0	1	1
0	1	0	1	1	0	1	1	0	1	1
0	1	1	0	1	0	1	1	1	1	1
0	1	1	1	1	1	1	0	0	0	0
1	0	0	0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	1	0	1	1

k maps for each segment :-

→ for c :

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

$$F(A B C D) = \bar{B}\bar{D} + C + A + BD$$

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→ for b :

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

$F(ABCD) = \bar{B} + C\bar{D} + CD$

→ for c :

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

$F(ABCD) = \bar{C} + D + B$

→ for d

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

$F(ABCD) = \bar{B}\bar{D} + \bar{B}C + B\bar{C}D + C\bar{D} + A$

→ for e

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

$F(ABCD) = \bar{B}\bar{D} + C\bar{D}$

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for d →

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

$f(ABCD) = \bar{C}\bar{D} + B\bar{C} + B\bar{D} + A$

→ for g

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

$F(ABCD) = \bar{B}C + B\bar{C} + A + B\bar{D}$

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