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5CSE-8Y

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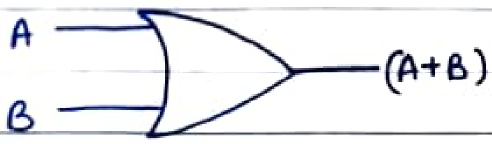
DMS
Assignment - 3

1. For addition in Boolean Algebra we use OR gate.

OR

A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1

Logic Gate



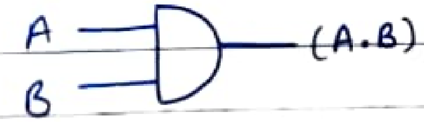
The boolean addition suggests that if any one of the input from the logic circuit is true (1) then its Boolean addition is (1).

2. For multiplication in Boolean Algebra we use AND gate.

AND

A	B	A.B
0	0	0
0	1	0
1	0	0
1	1	1

Logic Gate



The boolean multiplication suggests that if any one of the input from the logic circuit is false (0) then its Boolean Multiplication is (0).

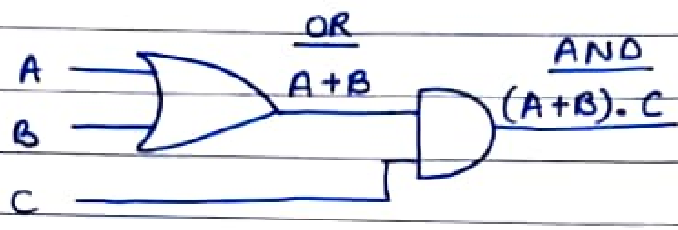
3. Compliment of a Boolean number is the reverse of that number i.e. $1' = 0$, $0' = 1$. If the Boolean Number is A then its compliment is denoted by $\bar{A}$ or A'. This is performed by NOT Gate.

NOT

A	$\bar{A}$ / A'
0	1
1	0

Logic Gate

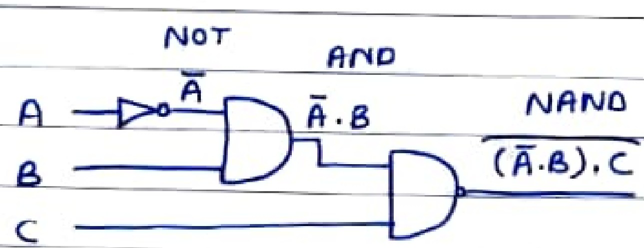
4.



Boolean Expression

$[(A+B).C]$

5.



Boolean Expression

$[(\bar{A}.B).C]'$

6.

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

$A + CD' + B'C + BC'D + B'C'D'$

7. According to question, output is defined "if and only if" the input is greater than 2 i.e. 0 - 2 will have don't care conditions. If input is greater than 2 output will be one (1) if it is not divisible by 3.

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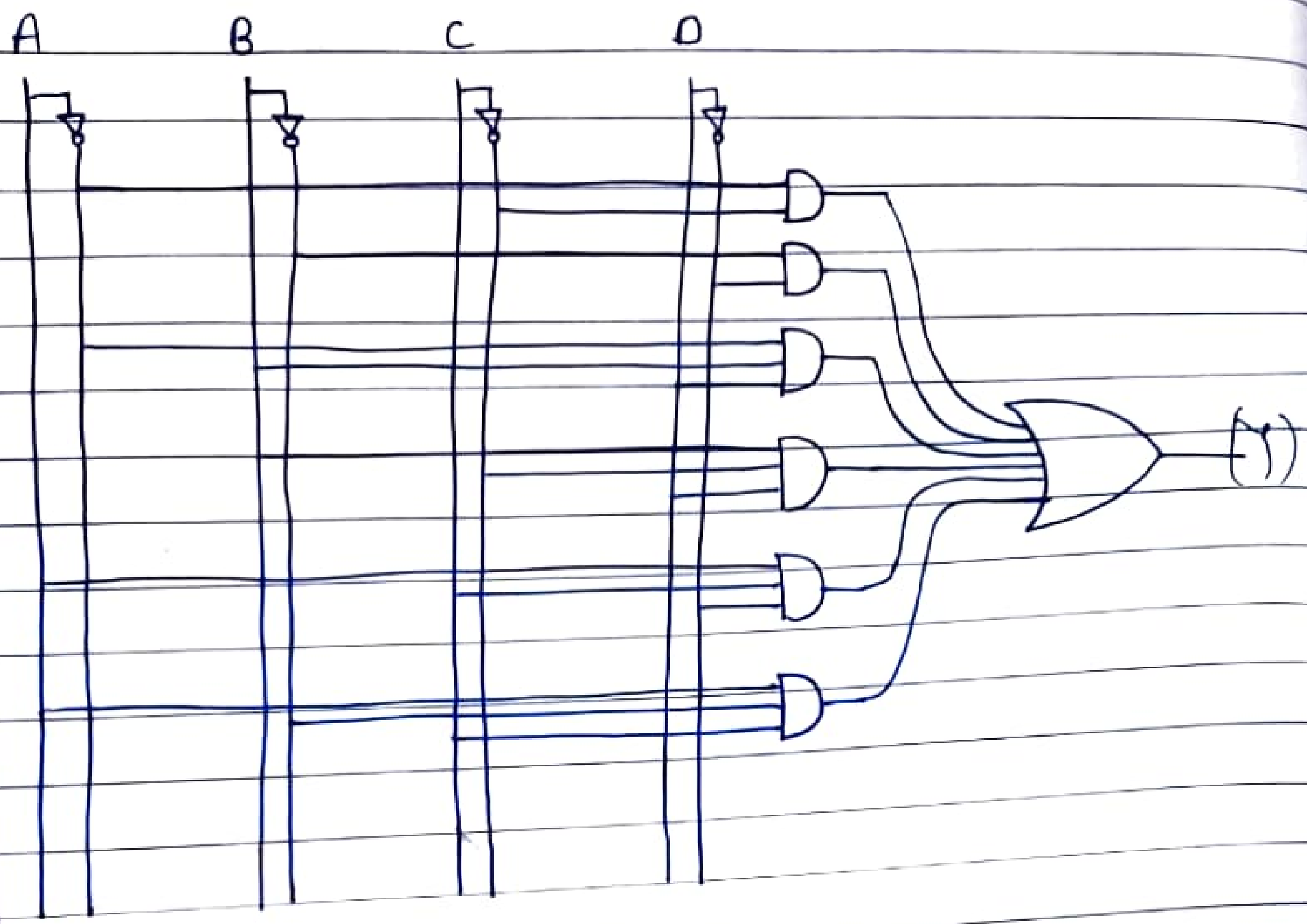
A	B	C	D	Output
0	0	0	0	X
0	0	0	1	X
0	0	1	0	X
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

Equivalent Karnaugh map

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

$A'C' + B'D' + A'BD + BC'D + ACD' + AB'C = (Y)$



Equivalent Digital Circuit

8. Quine McCluky tabular method is a tabular method based on the concept of prime applicants. Prime implicant is a product or sum term which can't be further reduced by combining with any other product or sum terms of given boolean functions. This tabular method is useful to get the prime implicants by repeadly using the following Boolean identity.

$$xy + xy' = x(y + y') = x.1 = x$$

$$(Y) = xyz + xy'z + x'yz + x'y'z + x'y'z'$$

i.e.

x	y	z	(Y)
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

$Y = \Sigma(0, 1, 3, 5, 7)$

Arranging them to their ascending order in terms of no. of min terms in them (1) i.e. no. of (1s) in their binary equivalence.

Grp	Dec. Eq.	No. of Min Term	Binary x y z
Grp 1	0	0	0 0 0
Grp 2	1	1	0 0 1
Grp 3	3, 5	2	0 1 1 , 1 0 1
Grp 4	7	3	1 1 1

Merge grps which have only one difference in their binary equivalence and show it using '–' sign.

Grp	Dec.	Binary x	y	z
1	0, 1	0	0	–
2	1, 3	0	–	1
	1, 5	–	0	1
3	3, 7	–	1	1
	5, 7	1	–	1

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Repeat the process.

Grp.	Dec.	Binary x	y	z
1	0, 1	0	0	-
2	1, 3, 5, 7	-	-	1
	1, 5, 3, 7	-	-	1

As, further merging is not possible, so we will remove the duplicate ones

		x	y	z
Grp 1	0, 1	0	0	-
Grp 2	1, 3, 5, 7	-	-	1

Therefore, the prime implicants are $x'y' + z$

$\therefore$ The minimal equivalence is $(\bar{X}\bar{Y} + Z)$.