

CSE 260

MID ASSIGNMENT

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Section: 11

Answer to the question no 1

There are 10 single digits (decimal) for the circuit. So the input range is : 0-9.

The outputs will be remainder when the input number is divided by 7.

Input (dec)	Input				Output			
	A	B	C	D	X	Y	Z	dec
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	1	1
2	0	0	1	0	0	1	0	2
3	0	0	1	1	0	1	1	3
4	0	1	0	0	1	0	0	4
5	0	1	0	1	1	0	1	5
6	0	1	1	0	1	1	0	6
7	0	1	1	1	0	0	0	0
8	1	0	0	0	0	0	1	1
9	1	0	0	1	0	1	0	2
10	1	0	1	0	X	X	X	X
11	1	0	1	1	X	X	X	X
12	1	1	0	0	X	X	X	X
13	1	1	0	1	X	X	X	X
14	1	1	1	0	X	X	X	X
15	1	1	1	1	X	X	X	X

Here,

For X , minterm = $\sum (4, 5, 6)$

don't care = $\sum (10, 11, 12, 13, 14, 15)$

	$C'D'$	$C'D$	CD	CD'
$A'B'$	0	1	3	2
$A'B$	4	5	7	6
AB	12	13	15	14
AB'	8	9	11	10

Diagram of a 4x4 Karnaugh map for variables A, B, C, D. The map shows minterms 0-15. Minterms 4, 5, and 6 are grouped together with a circle, representing the minterm sum $\sum (4, 5, 6)$. Minterms 10, 11, 12, 13, 14, and 15 are marked with an 'X', representing the don't care terms $\sum (10, 11, 12, 13, 14, 15)$. The map is labeled with $A'B'$, $A'B$, AB , and AB' on the left, and $C'D'$, $C'D$, CD , and CD' on the top.

$$X = BC' + BD'$$

For y ,

$$\text{Minterm} = \sum (2, 3, 6, 9)$$

$$\text{don't care} = \sum (10, 11, 12, 13, 14, 15)$$

	$C'D'$	$C'D$	CD	CD'	
$A'B'$	0	1	1	2	$B'A$
$A'B$	4	5	7	6	$B'A$
AB	X	X	X	X	$B'A$
AB'	8	9	11	10	$B'A$

$$\therefore y = B'C + C'D + AD$$

For Z ,

$$\text{minterm} = \sum (1, 3, 2, 8)$$

$$\text{don't care} = \sum (10, 11, 12, 13, 14, 15)$$

	$c'd'$	$c'd$	cd	cd'	
$A'B'$		1	1		0A
$A'B$		1			0A
AB	X	X	X	X	0A
AB'	1		X	X	0A

$$\therefore Z = AD' + A'B'D + BC'D$$

$$1A + 1'D + 1D = Y \therefore$$

So, we get,

$$X = BC' + BD'$$

$$Y = B'C + c'D' + AD$$

$$Z = AD' + A'B'D + BC'D$$

Drawing the circuit:

