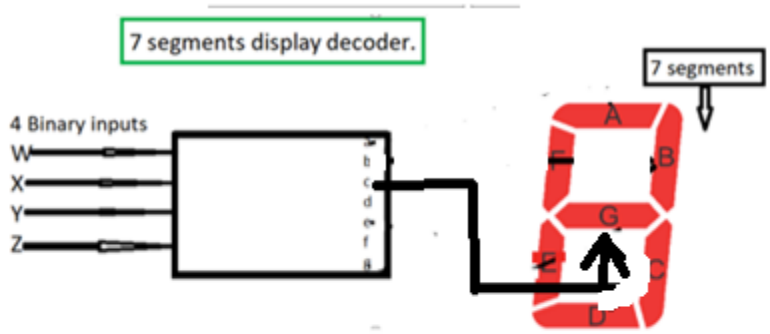
MAC283 Midterm Solutions.

1. Design and implement a 7 segments decoder for the segment “g(12)” Draw the schematics using a circuit simulation program. (35%)

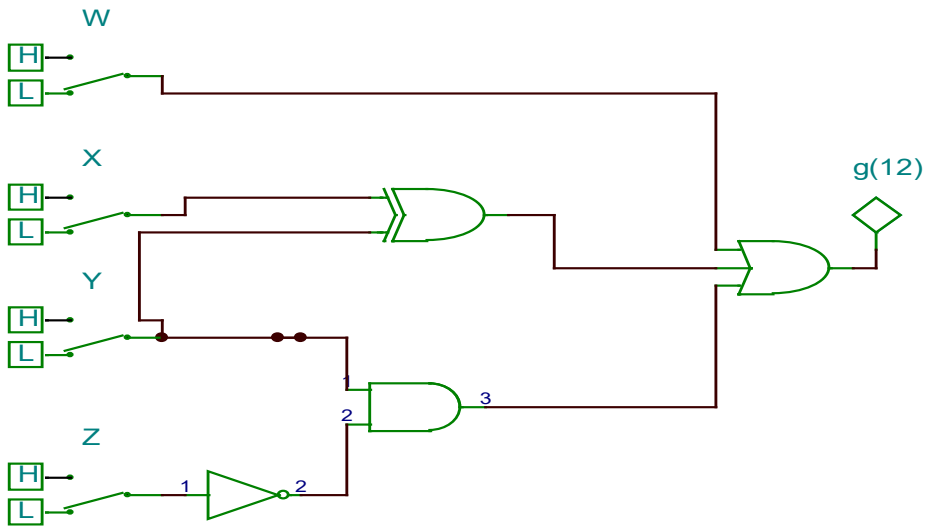


Specifications Table for the decoder

	IN	IN	IN	IN		OUT
Count	W	X	Y	Z		g
0	0	0	0	0		0
1	0	0	0	1		0
2	0	0	1	0		1
3	0	0	1	1		1
4	0	1	0	0		1
5	0	1	0	1		1
6	0	1	1	0		1
7	0	1	1	1		0
8	1	0	0	0		1
9	1	0	0	1		1
10(A)	1	0	1	0		1
11(B)	1	0	1	1		1

WX YZ	00	01	11	10
00	0	1	**d**	**1**
01	0	1	**d**	**1**
11	**1**	0	**d**	**1**
10	**1**	1	**d**	**1**

g(12) = W + YZ’ + XY’ + X’Y = W + YZ’ + X(+)Y



2. 40% Design and implement using T-FF a binary loop counter that counts: 0→2→1→6 and back to 0 in a loop. Use Karnaugh maps to obtain the circuit and thereafter, a circuit simulation software to implement the counter circuit.

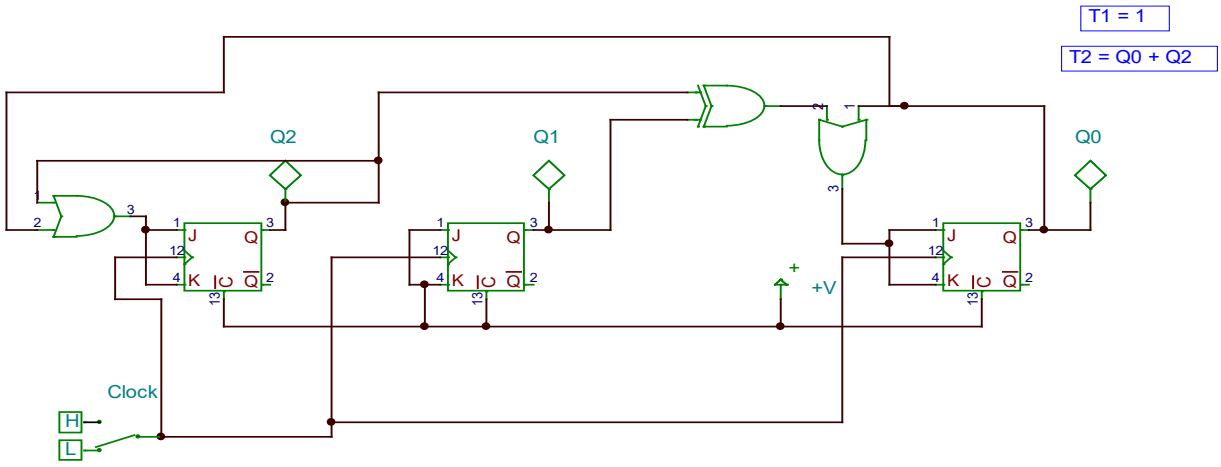
Count	Q2	Q1	Q0
0	0	0	0
2	0	1	0
1	0	0	1
6	1	1	0

Q2 **Q1Q0**	0	1
00	0	d
01	1	d
11	d	d
10	1	0

T0= Q0 + Q2'Q1 or 2nd solution Q0 + Q2(+)Q1 T1 = 1

Q2 **Q1Q0**	0	1
00	0	d
01	1	d
11	d	d
10	0	1

T2 = Q0 + Q2



3. Simplify the following Karnaugh map and implement its most simplified circuit using a circuit simulation program. 25%

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

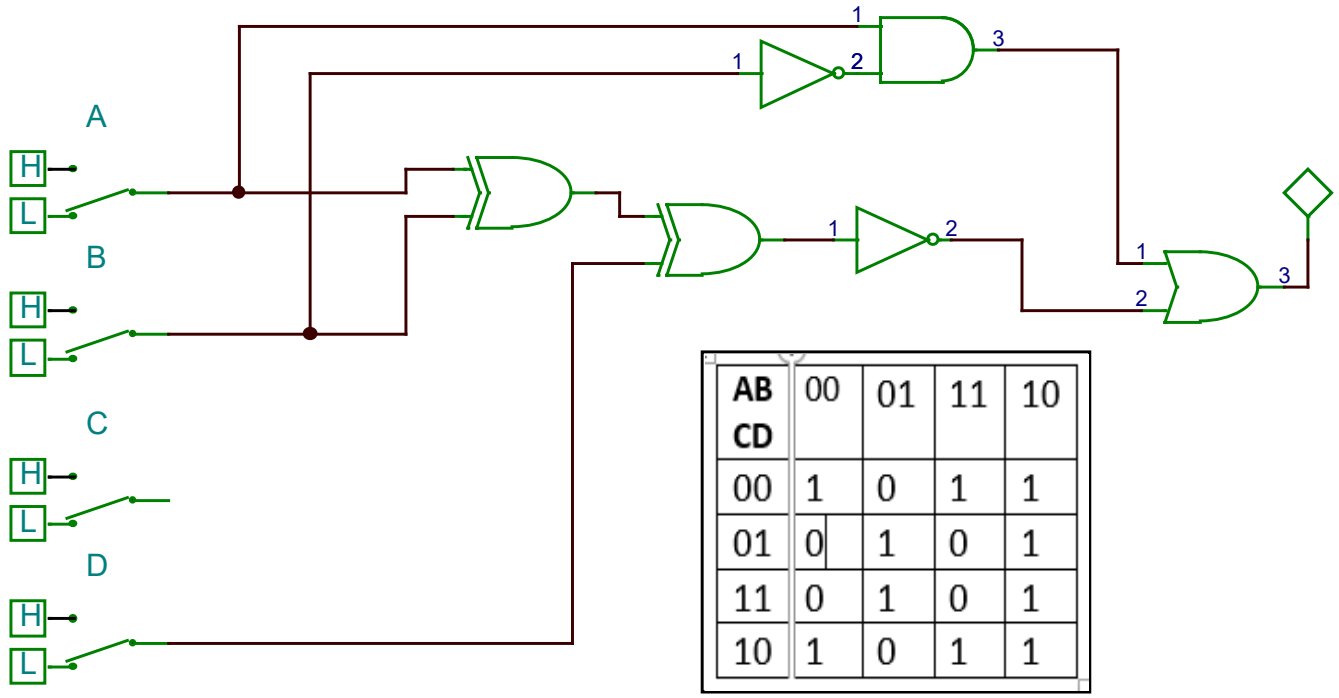
Y = A'B'D' + A'BD + ABD' + AB'D + AB'

Y = A'(B'D'+ BD) + A(B'D+BD') + AB'

Y = A'(B(+)D)' + A(B(+)D) + AB'

Y = A'W' + AW + AB'

Y = (A(+)B(+)D)' + AB'



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