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Q1

The truth table is:

$A_3 A_2 A_1 A_0$	$B_3 B_2 B_1 B_0$
0000	0000
0001	1111
0010	1110
0011	1101
0100	1100
0101	1011
0110	1010
0111	1001
1000	1000
1001	0111
1010	0110
1011	0101
1100	0100
1101	0011
1110	0010
1111	0001

k-map:

$B_0$

	00	01	11	10
00	0	1	1	0
01	0	1	1	0
11	0	1	1	0
10	0	1	1	0

$$B_0 = A_0$$

$B_1$

	00	01	11	10
00	0	1	0	1
01	0	1	0	1
11	0	1	0	1
10	0	1	0	1

$$B_1 = A_1 A_0' + A_1 A_0$$

$B_2$

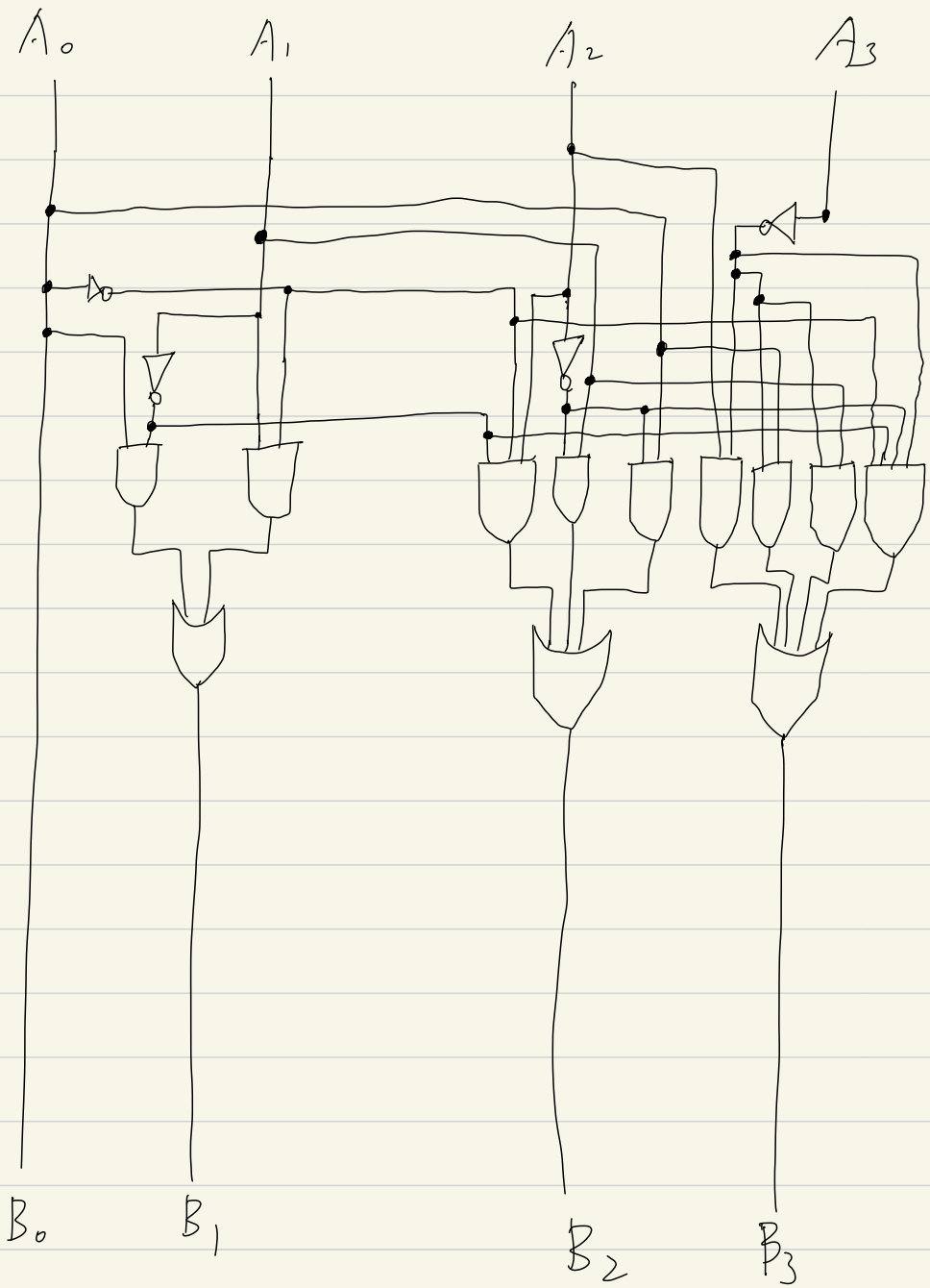
	00	01	11	10
00	0	1	1	1
01	1	0	0	0
11	1	0	0	0
10	0	1	1	1

$$B_2 = A_2 A_1' A_0' + A_2' A_0' + A_2' A_1$$

$B_3$

	00	01	11	10
00	0	1	1	1
01	1	1	1	1
11	0	0	0	0
10	1	0	0	0

$$B_3 = A_3' A_2 + A_0 A_3' + A_1 A_3' + A_0 A_1 A_3$$



Q<sub>2</sub>

We know that

$$B_3 B_2 B_1 B_0 \times A_2 A_1 A_0$$

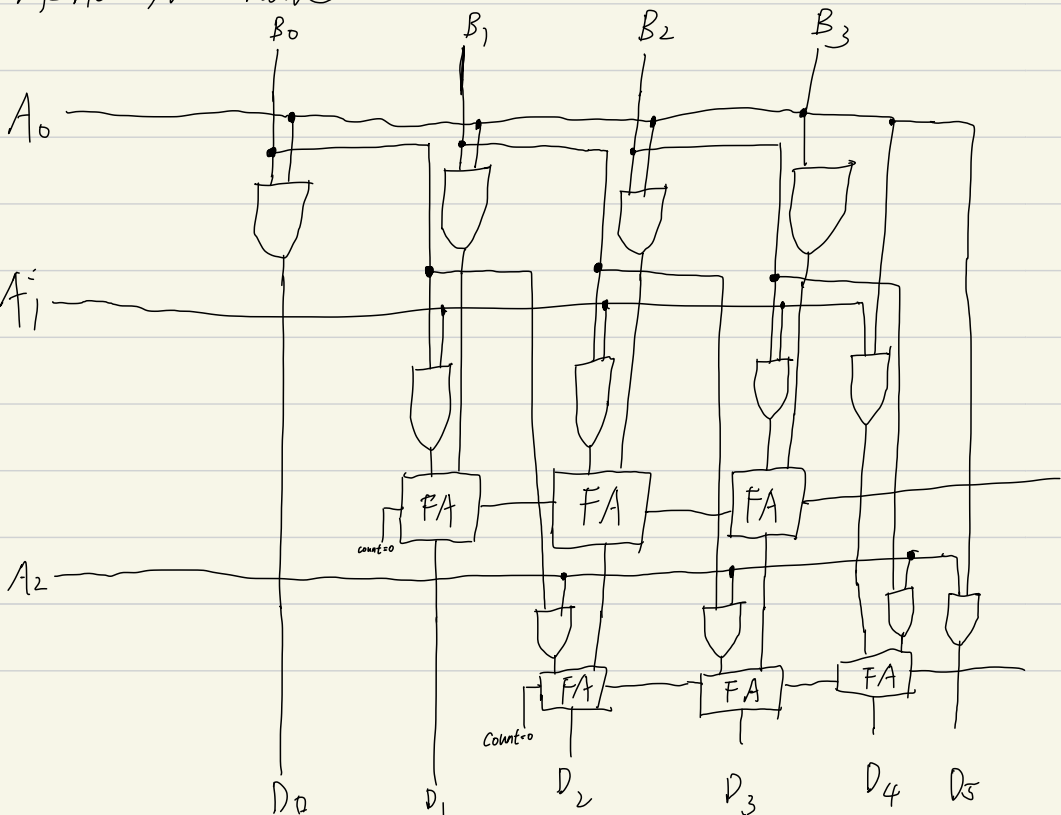
⇒

$$B_3 B_2 B_1 B_0$$

$$A_2 A_1 A_0$$

$B_3 A_0$	$B_2 A_0$	$B_1 A_0$	$B_0 A_0$	
$B_3 A_1$	$B_2 A_1$	$B_1 A_1$	$B_0 A_1$	
$C_4$	$C_3$	$C_2$	$C_1$	$C_0$
$B_3 A_2$	$B_2 A_2$	$B_1 A_2$	$B_0 A_2$	
$D_5$	$D_4$	$D_3$	$D_2$	$D_1$
				$D_0$

Hence, we have :



Q3.

The truth table of the circuit is:

BCD digit				9's complement			
$A_3$	$A_2$	$A_1$	$A_0$	$B_3$	$B_2$	$B_1$	$B_0$
0	0	0	0	1	0	0	0
0	0	0	1	1	0	0	0
0	0	1	0	0	1	1	1
0	0	1	1	0	1	1	0
0	1	0	0	0	1	0	1
0	1	0	1	0	1	0	0
0	1	1	0	0	0	1	1
0	1	1	1	0	0	1	0
1	0	0	0	0	0	0	1
1	0	0	1	0	0	0	0

K-map:

$B_0 = A_0'$

	$A_3A_2$	00	01	11	10
$B_0$	00	1	0	0	1
	01	1	0	0	1
	11	X	X	X	X
	10	1	0	X	X

$B_1 = A_1$

	$A_3A_2$	00	01	11	10
$B_1$	00	0	0	1	1
	01	0	0	1	1
	11	X	X	X	X
	10	0	0	X	X

$$B_2$$

	$A_1 A_0$	00	01	11	10
$A_2 A_1$	00	0	0	1	1
	01	1	1	0	0
	11	X	X	X	X
	10	0	0	X	X

$$B_3$$

	$A_1 A_0$	00	01	11	10
$A_3 A_2$	00	1	1	0	0
	01	0	0	0	0
	11	X	X	X	X
	10	0	0	X	X

$$B_2 = A_1' A_2 A_3 + A_1 A_2' A_3'$$

$$B_3 = A_1' A_2' A_3'$$

