

2. Design an Excess3-to-Aiken decoder in the form of product of sums.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>F1</i>	<i>F2</i>	<i>F3</i>	<i>F4</i>	#
0	0	0	0	X	X	X	X	0
0	0	0	1	X	X	X	X	1
0	0	1	0	X	X	X	X	2
0	0	1	1	0	0	0	0	3
0	1	0	0	0	0	0	1	4
0	1	0	1	0	0	1	0	5
0	1	1	0	0	0	1	1	6
0	1	1	1	0	1	0	0	7
1	0	0	0	1	0	1	1	8
1	0	0	1	1	1	0	0	9
1	0	1	0	1	1	0	0	10
1	0	1	1	1	1	1	0	11
1	1	0	0	1	1	1	1	12
1	1	0	1	X	X	X	X	13
1	1	1	0	X	X	X	X	14
1	1	1	1	X	X	X	X	15

(F1) CD

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

(F2) CD

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

(F3) CD

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

(F4) CD

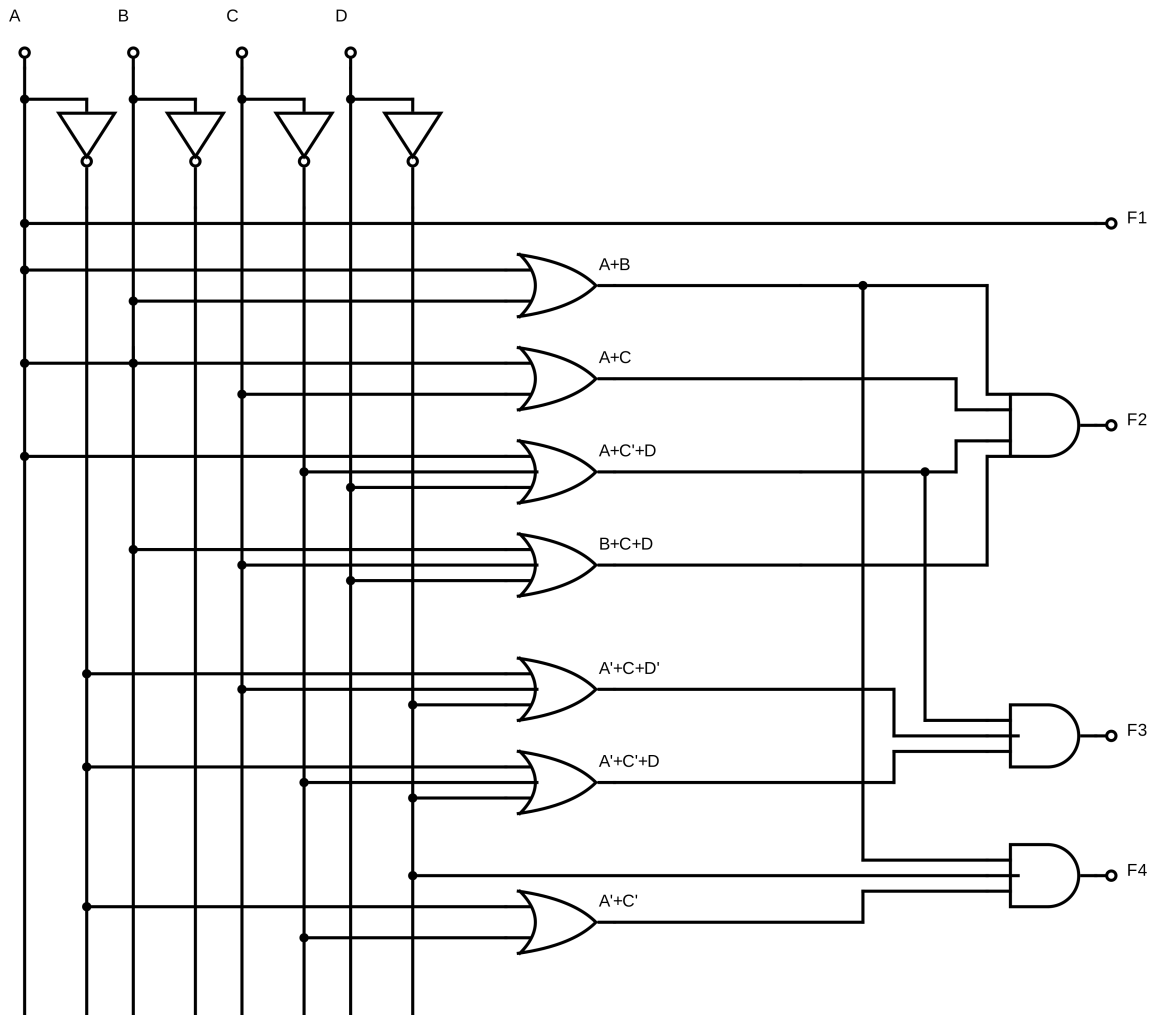
	00	01	11	10
00	X	X	1	X
01	0	1	1	0
11	0	X	X	X
10	0	1	1	1

$$\begin{aligned}\therefore F1 &= (A')' \\ &= A\end{aligned}$$

$$\begin{aligned}\therefore F2 &= ((A'B') + (A'C')' + (A'CD')' + (B'C'D'))' \\ &= (A + B)(A + C)(A + C' + D)(B + C + D)\end{aligned}$$

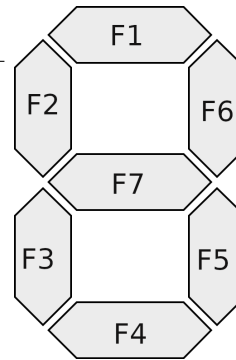
$$\begin{aligned}\therefore F3 &= ((A'CD) + (AC'D) + (ACD'))' \\ &= (A + C' + D)(A' + C + D')(A' + C' + D)\end{aligned}$$

$$\begin{aligned}\therefore F4 &= ((A'B') + (D) + (AC))' \\ &= (A + B)(D')(A' + C')\end{aligned}$$



3. Design a 7-segment decoder for Aiken.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>F1</i>	<i>F2</i>	<i>F3</i>	<i>F4</i>	<i>F5</i>	<i>F6</i>	<i>F7</i>	#
0	0	0	0	1	1	1	1	1	1	1	0
0	0	0	1	0	0	0	0	1	1	0	1
0	0	1	0	1	0	1	1	0	1	1	2
0	0	1	1	1	0	0	1	1	1	1	3
0	1	0	0	0	1	0	0	1	1	1	4
0	1	0	1	X	X	X	X	X	X	X	5
0	1	1	0	X	X	X	X	X	X	X	6
0	1	1	1	X	X	X	X	X	X	X	7
1	0	0	0	X	X	X	X	X	X	X	8
1	0	0	1	X	X	X	X	X	X	X	9
1	0	1	0	X	X	X	X	X	X	X	10
1	0	1	1	1	1	0	1	1	0	1	11
1	1	0	0	1	1	1	1	1	0	1	12
1	1	0	1	1	0	0	0	1	1	0	13
1	1	1	0	1	1	1	1	1	1	1	14
1	1	1	1	1	1	0	1	1	1	1	15



(F1) CD

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

(F2) CD

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

(F3) CD

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

(F4) CD

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

(F5) CD

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

(F6) CD

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

(F7) CD

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

$$\begin{aligned}\therefore F1 &= ((A'C'D) + (A'B))' \\ &= (A + C + D')(A + B')\end{aligned}$$

$$\begin{aligned}\therefore F2 &= ((A'D) + (A'C))' \\ &= (A + D')(A + C')\end{aligned}$$

$$\begin{aligned}\therefore F3 &= ((D) + (A'B))' \\ &= (D')(A + B')\end{aligned}$$

$$\begin{aligned}\therefore F4 &= ((C'D) + (A'B))' \\ &= (C + D')(A + B')\end{aligned}$$

$$\begin{aligned}\therefore F5 &= (A'CD')' \\ &= (A + C' + D)\end{aligned}$$

$$\begin{aligned}\therefore F6 &= ((AC'D') + (AB'))' \\ &= (A' + C + D)(A' + B)\end{aligned}$$

$$\begin{aligned}\therefore F7 &= (C'D)' \\ &= (C + D')\end{aligned}$$

