Instructions:
Press spacebar to set input to 1. This starts the series of numbers from ‘F’.
If the system starts with a high input, the output will start from ‘0’.

Design:

F 0 2 8 1 3 0 coded as F 0 2 8 1 3 4

4 must show as 0

Current	Next
F	0
0	2
2	8
8	1
1	3
3	4
4	F
F	0

	Current	Next
F	1 1 1 1	0 0 0 0
0	0 0 0 0	0 0 1 0
2	0 0 1 0	1 0 0 0
8	1 0 0 0	0 0 0 1
1	0 0 0 1	0 0 1 1
3	0 0 1 1	0 1 0 0
0	0 1 0 0	1 1 1 1
	1 1 1 1	0 0 0 0

Q_0 :

Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	0	1	0	0
01	1	X	X	X
11	X	X	0	X
10	1	X	X	X

$$Q_0 = \overline{Q_1}\,Q_0 + \overline{Q_3}\,Q_2 + Q_3\overline{Q_2}$$

→ XOR gate?

Q_1 :

Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	1	1	0	0
01	1	X	X	X
11	X	X	0	X
10	0	X	X	X

$$Q_1 = \overline{Q_3}\,\overline{Q_1}$$

Q_2 :

Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	0	0	1	0
01	1	X	X	X
11	X	X	0	X
10	0	X	X	X

$$Q_2 = \overline{Q_3}\,Q_2 + \overline{Q_3}\,Q_1Q_0$$

$$\overline{Q_3}\,(Q_2 + Q_1Q_0)$$

Q_3:

Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	0	0	0	1
01	1	X	X	X
11	X	X	0	X
10	0	X	X	X

Current	Next
1111	0000
0000	0010
0010	1000
1000	0001
0001	0011
0011	0100
0100	1111
1111	0000

$$Q_3 = \overline{Q_3}Q_2 + Q_1\overline{Q_0}$$

Substitution of 4 to show 0

Current	Displays as
F	F
0	0
2	2
8	8
1	1
3	3
4	0

	Current	Displ-s
F	1 1 1 1	1 1 1 1
0	0 0 0 0	0 0 0 0
2	0 0 1 0	0 0 1 0
8	1 0 0 0	1 0 0 0
1	0 0 0 1	0 0 0 1
3	0 0 1 1	0 0 1 1
0	0 1 0 0	0 0 0 0

No change except for Q_2

Q_2:

Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	0	0	0	0
01	0	X	X	X
11	X	X	1	X
10	0	X	X	X

$Q_2 = Q_2 Q_0$