Digital System Assignment 3

He Tianyang

March 27, 2024

1 Problem 1

Utilize an 8-bit Mux CT74LS151 for the implementation of a 4-bit even-odd checker. The input consists of a 4-bit binary number, producing an output of 1 if the count of 1s in the input is even, and 0 if it is odd. Refer to the truth table provided below. Additionally, furnish the circuit diagram along with comprehensive design steps.

Solves:

First, we need to design the truth table of the 4-bit even-odd checker. The truth table is shown below.

Input	Output
0000	1
0001	0
0010	0
0011	1
0100	0
0101	1
0110	1
0111	0
1000	0
1001	1
1010	1
1011	0
1100	1
1101	0
1110	0
1111	1

Based on the truth table, we can draw the Karnaugh map of the 4-bit even-odd checker using dimension reduction method. The K-map is shown below.

AB \ C	0	1
00	$\overline{D}$	D
01	D	$\overline{D}$
11	$\overline{D}$	D
10	D	$\overline{D}$

Therefore, the circuit diagram of the 4-bit even-odd checker is shown in Figure 1.

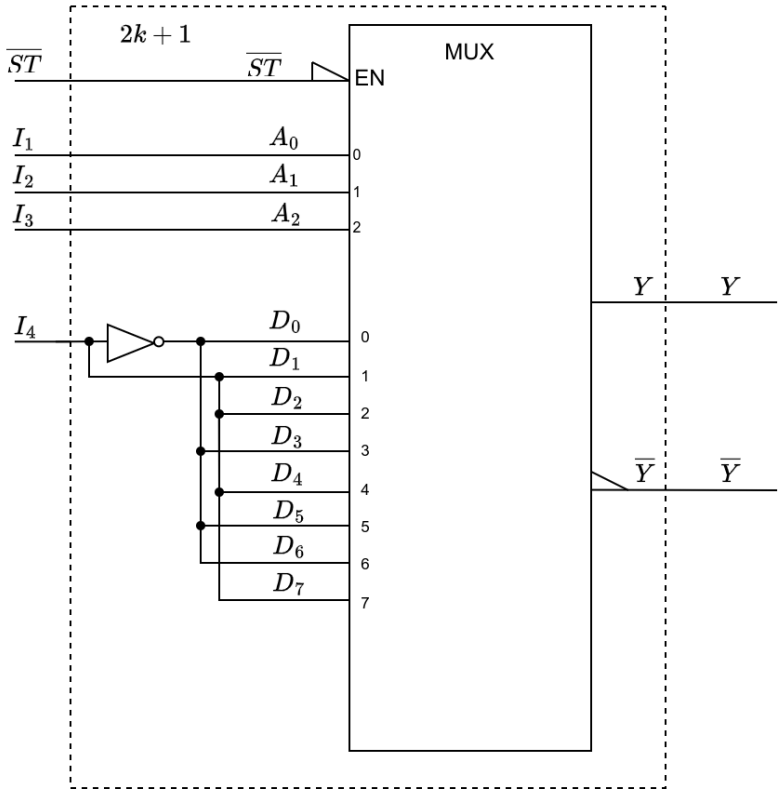

Figure 1: Circuit diagram of the 4-bit even-odd checker.