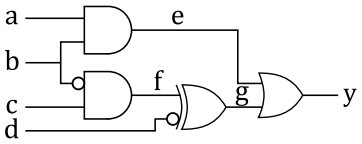
Multiplexer and Demultiplexer

Exercises Digital Design

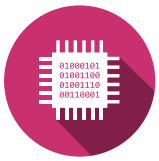
Solution vs. Hints:
While not every response provided herein constitutes a comprehensive solution, some serve as helpful hints intended to guide you toward discovering the solution independently. In certain instances, only a portion of the solution is presented.

1 | MUX - Multiplexer

1.1 Creating a function with the help of Multiplexers



mux/mux-01



1.2 Creating a function with the help of Multiplexers

a	b	c	d	y	y'
0	0	0	0	0	d
0	0	0	1	1	
0	0	1	0	1	$\overline{d}$
0	0	1	1	0	
0	1	0	0	1	$\overline{d}$
0	1	0	1	0	
0	1	1	0	0	d
0	1	1	1	1	
1	0	0	0	1	$\overline{d}$
1	0	0	1	0	
1	0	1	0	0	d
1	0	1	1	1	
1	1	0	0	0	d
1	1	0	1	1	
1	1	1	0	1	$\overline{d}$
1	1	1	1	0	

mux/mux-02

1.3 Creating a function with the help of Multiplexers

1.3.1 Solution

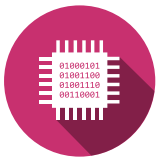
- For y 4xMux 2-1
- For z 4xMux 2-1

mux/mux-03

1.4 Creating a function with the help of Multiplexers

- $s = \overline{c}$
- $y = 1$
- $w = \overline{a}$
- ...

mux/mux-04

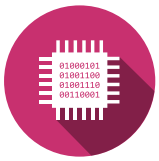


1.5 Creating a function with the help of Multiplexers

The truthtable non simplified is:

d	c	b	a	y	z
0	0	0	0	1	1
0	0	0	1	1	1
0	0	1	0	1	1
0	0	1	1	1	1
0	1	0	0	0	0
0	1	0	1	0	0
0	1	1	0	1	0
0	1	1	1	0	0
1	0	0	0	1	0
1	0	0	1	1	1
1	0	1	0	1	0
1	0	1	1	0	0
1	1	0	0	0	1
1	1	0	1	1	1
1	1	1	0	1	1
1	1	1	1	0	1

mux/mux-05



2 | MUX - Demultiplexer

2.1 Demultiplexer from 1 to 8

You need 8xAND-4 + 3xNOT

mux/demux-01

2.2 Logic Circuit

You need a XNOR with 2 inputs.

mux/demux-02

2.3 Complete Operators

Multiplexer 2-1 as well as a Demultiplexer 1-2 are both complete operators.

mux/demux-03