

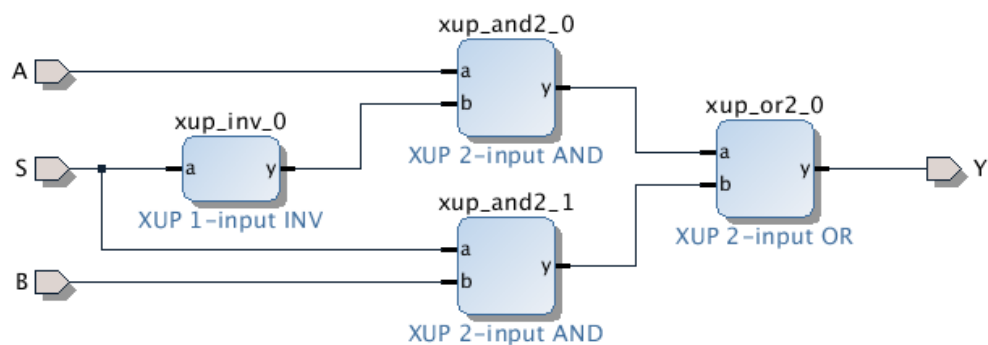
# LAB1: MUX

Group Member: Rui Chen/Mengxi Wang

Complete Time: 09/14/2017

## TASK2: 2:1 Multiplexer

### 1. Block Design:



Img1: 2:1 multiplexer block design

### 2. Description:

#### 2.1 Truth Table:

A	B	S	OUTPUT
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1

1	0	1	0
1	1	0	1
1	1	1	1

Chart1: Truth table of 2:1 multiplexer

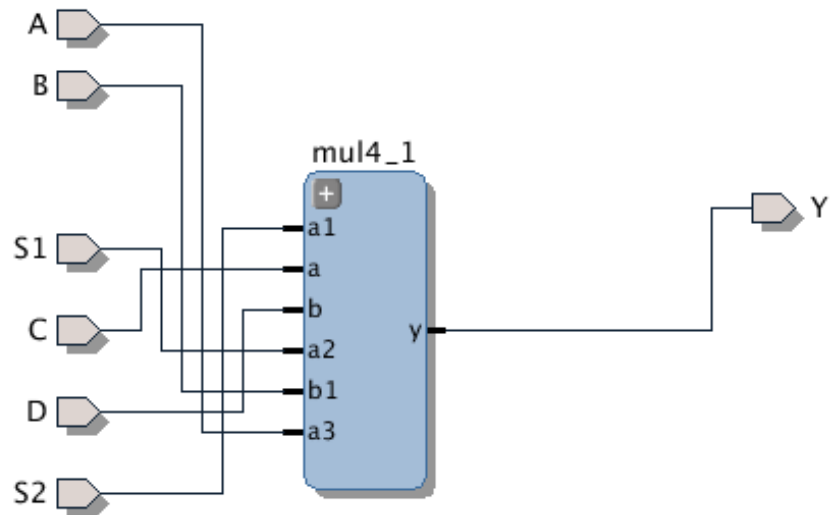
## 2.2 Phenomenon on the board:

- When  $S=0$ , whether the LED lights up (output=1) or not (output=0) only depends on A, that is S chooses A;
- When  $S=1$ , whether the LED lights up (output=1) or not (output=0) only depends on B, that is S chooses B.
- We use the basic inverter which is built in Task1 to implement  $S'$ .

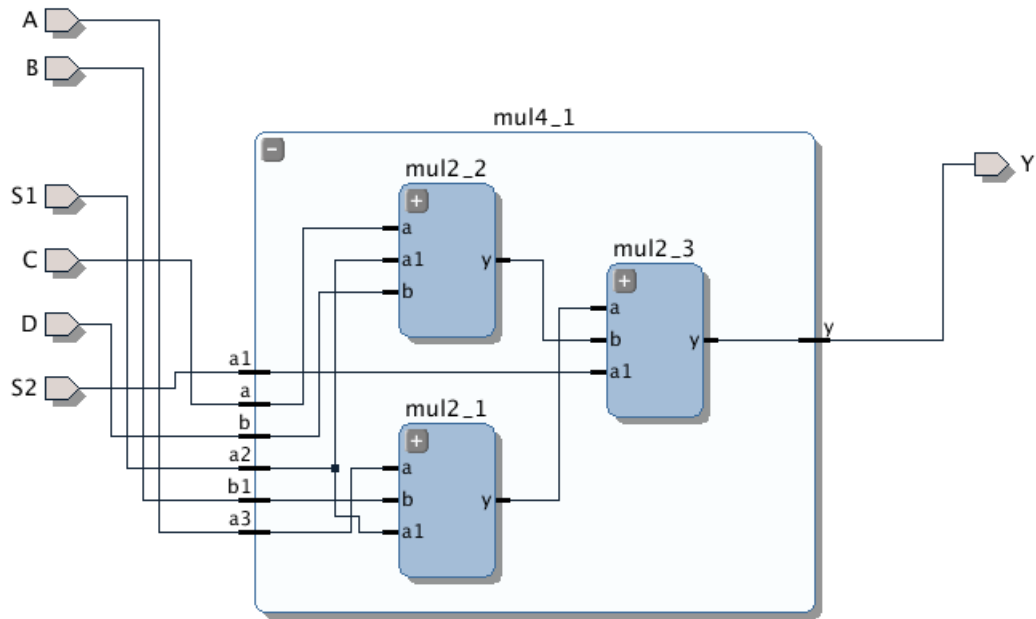
## TASK3: 8:1 Multiplexer

### 3.1 4:1 Mux

#### 1. Block Design:



Img2: 4:1 multiplexer block design



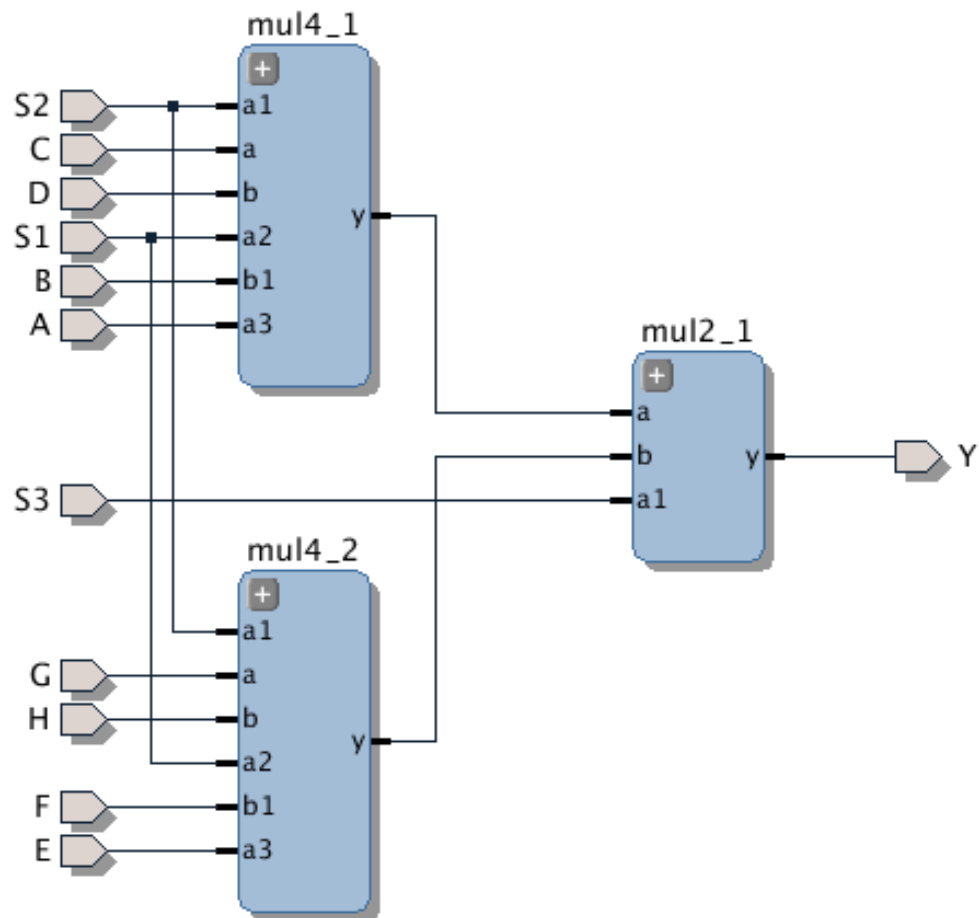
Img3: 4:1 multiplexer inner block design

## 2. Description:

- When S2S1=00, the output depends on A.
- When S2S1=01, the output depends on B.
- When S2S1=10, the output depends on C.
- When S2S1=11, the output depends on D.

## 3.2 8:1 Mux (Without clock):

### 1. Block Design:



Img4: 8:1 multiplexer (without clock) block design

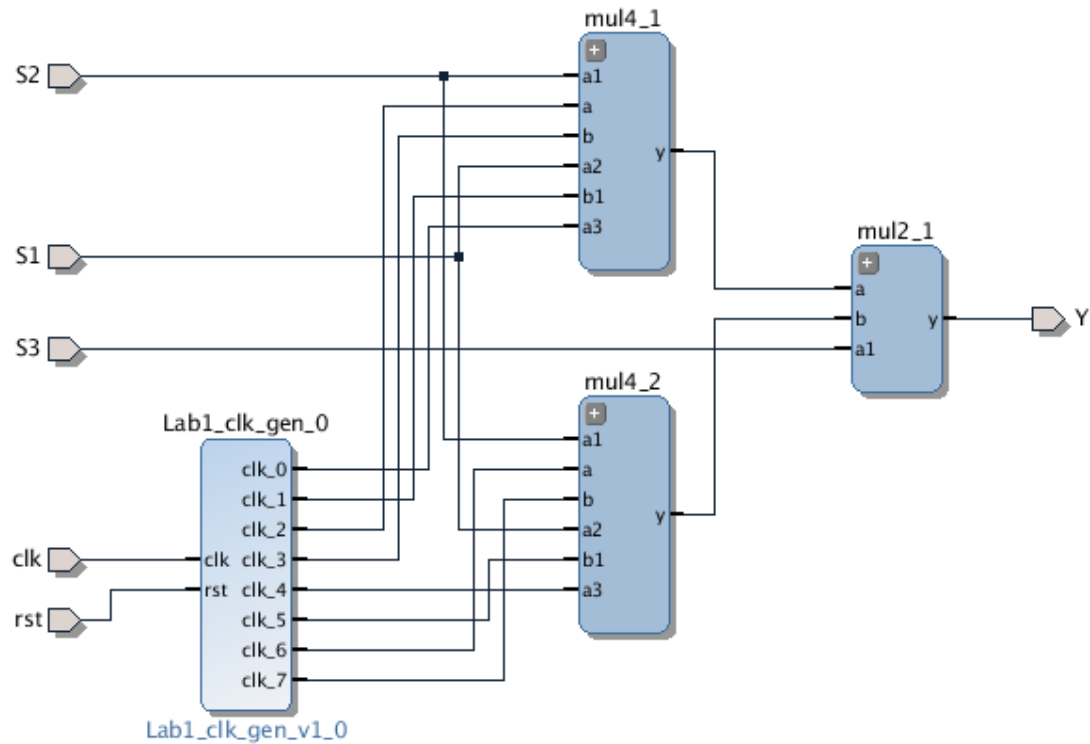
## 2. Description:

- When  $S_3S_2S_1=000$ , the output depends on A.
- When  $S_3S_2S_1=001$ , the output depends on B.
- When  $S_3S_2S_1=010$ , the output depends on C.
- When  $S_3S_2S_1=011$ , the output depends on D.
- When  $S_3S_2S_1=100$ , the output depends on E.
- When  $S_3S_2S_1=101$ , the output depends on F.
- When  $S_3S_2S_1=110$ , the output depends on G.

- When  $S_3S_2S_1=111$ , the output depends on H.

### 3.3 8:1 Mux(with clock)

#### 1. Block Design:



Img5: 8:1 multiplexer (with clock) block design

#### 2. Description:

- When  $S_3S_2S_1=000$ , the LED flashes at the frequency of 1Hz.
- When  $S_3S_2S_1=001$ , the LED flashes at the frequency of 2Hz.
- When  $S_3S_2S_1=010$ , the LED flashes at the frequency of 4Hz.
- When  $S_3S_2S_1=011$ , the LED flashes at the frequency of 8Hz.
- When  $S_3S_2S_1=100$ , the LED flashes at the frequency of 16Hz.
- When  $S_3S_2S_1=101$ , the LED flashes at the frequency of 32Hz.
- When  $S_3S_2S_1=110$ , the LED flashes at the frequency of 64Hz.

- When  $S_3S_2S_1=111$ , the LED flashes at the frequency of 128Hz.