2023 Digital IC Design Homework 1

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Functional Simulation Result							
Stage 1	Pass	Stage 2	Pass	Stage 3	Pass	Stage 4	Pass

Stage 1

```
ModelSim> run -all
# ------------Stage 1 : Maximum selection with 4-input MMS-------------
#
# ------------Stage 1 :              Pass!              -------------
```

Stage 2

```
#
# -------------Stage 2 : Minimum selection with 4-input MMS-------------
#
# -------------Stage 2 :              Pass!              -------------
```

Stage 3

```
#
# -------------Stage 3 : Maximum selection with 8-input MMS-------------
#
# -------------Stage 3 :              Pass!              -------------
```

Stage 4

```
#
# -------------Stage 4 : Minimum selection with 8-input MMS-------------
#
# -------------Stage 4 :              Pass!              -------------
#
# --------------------------------------------------------------------
#
# ---------------      Simulation finish,  ALL PASS      ---------------
#
```
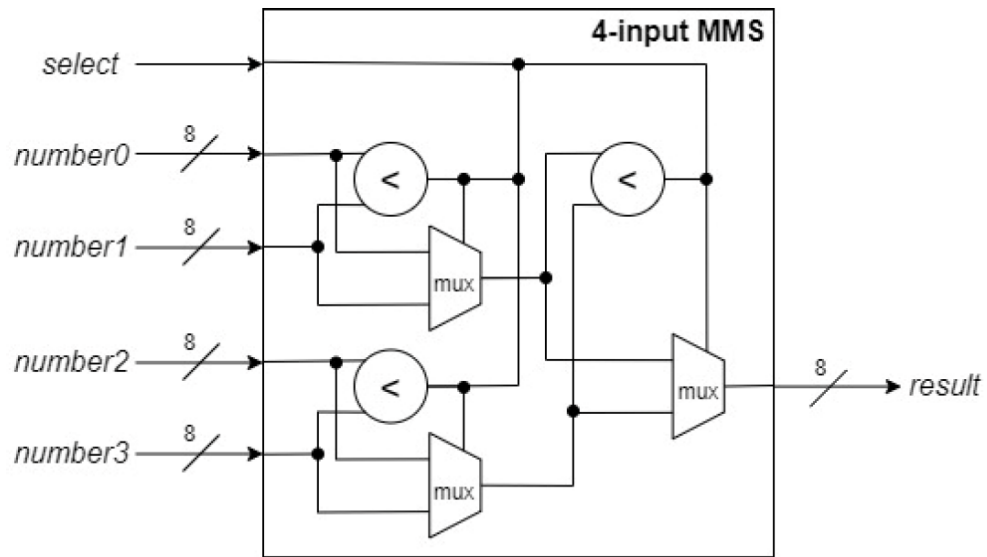
Description of your design

Fig. 1. The logic diagram of the 4-input MMS.

依照上圖要求區分出兩個 module (cmp 以及 muxMM)

cmp：進行兩個輸入的大小判斷，再依據 multiplexer selection cases

　當上面的輸入(num_a)小於下面的輸入(num_b)就設定成 1，反之為 0。

muxMM：使用 case 去實做判斷 sel_cmp 對應就是下面的 table

Table II. The selection case of the multiplexer.

{select, cmp}	output
00	input1
01	input2
10	input2
11	Input1

　　select 為 1 表示要選擇最小的。

MMS_4num：instantiate 設計出的 modules 把對應的線串接起來。

　串線的關係可以根據命名看出，舉例 cmpS0_0_muxS0_0，就是 stage0 的 cmp 的輸出到 stage0 的 muxMM，相同 module 的編碼由上而下，由 0 開始。

```
vsim -gui -novopt work.MMS_tb
# vsim -gui -novopt work.MMS_tb
# Refreshing D:/Master shit life/111-2/dic2023/HWs/HW1/file/work.MMS_tb
# Loading work.MMS_tb
# Refreshing D:/Master shit life/111-2/dic2023/HWs/HW1/file/work.MMS_4num
# Loading work.MMS_4num
# Refreshing D:/Master shit life/111-2/dic2023/HWs/HW1/file/work.cmp
# Loading work.cmp
# Refreshing D:/Master shit life/111-2/dic2023/HWs/HW1/file/work.muxMM
# Loading work.muxMM
# Refreshing D:/Master shit life/111-2/dic2023/HWs/HW1/file/work.MMS_8num
# Loading work.MMS_8num
ModelSim> run -all
# -------------Stage 1 : Maximum selection with 4-input MMS-------------
#
# -------------Stage 1 :               Pass!                -------------
#
# -------------Stage 2 : Minimum selection with 4-input MMS-------------
#
# -------------Stage 2 :               Pass!                -------------
#
# -------------Stage 3 : Maximum selection with 8-input MMS-------------
#
# -------------Stage 3 :               Pass!                -------------
#
# -------------Stage 4 : Minimum selection with 8-input MMS-------------
#
# -------------Stage 4 :               Pass!                -------------
#
# --------------------------------------------------------------------
#
# ---------------        Simulation finish,  ALL PASS      ---------------
#
# --------------------------------------------------------------------
# ** Note: $finish    : D:/Master shit life/111-2/dic2023/HWs/HW1/file/MMS_tb.v(182)
#    Time: 1800100 ns  Iteration: 0  Instance: /MMS_tb
```