



Class Project (1 to 4 students)

Problem:

Design and Implement a circuit that has two 8-bit inputs and one 16-bit output to perform the following tasks based on the user choice determined by C_0 and C_1 .

Case 00:

the circuit generate the complement of the first input and show the result in the 8 least significant bits of the output

Case 01:

the circuit perform a modulo 256 count down with the ability to hold the result if (H) is asserted. The result is shown in the 8 most significant bits of the output.

Case 10:

the circuit multiply both inputs using shift and add method.

Case 11:

the circuit generates the even parity of the second input and show the result in the most significant bit of the output.

Assume all nMOS and pMOS has ($W=4\lambda$, $L=2\lambda$) unless it is necessary to change sizing. The inputs and outputs of your design are as follows:

Inputs:

An unsigned 8-bit first input A ($a_7: a_0$)
An unsigned 8-bit second input B ($b_7: b_0$)
User choice bits C_0 and C_1 .
Clocking signals Phi1, Phi1_b, Phi2, Phi2_b.
Counter holder H.
A common VDD and common GND lines
Any other necessary inputs

Outputs:

An unsigned 16-bit output Q ($q_{15}: q_0$)

Any other necessary outputs

Requirement:

Phase 1:

- Part 1: Verify the design using a logic design tool and an HDL tool (VHDL or Verilog) using structural method
- Part 2: List in a table the required components with their respective input and output labels.

Phase 2:

- Part 3: Implement your design using Magic VLSI layout tool to generate your project layout
<http://opencircuitdesign.com/magic/>
- Part 4: Test your design using *irsim* to simulate your project.
<http://opencircuitdesign.com/irsim/>

Deliverables:

1- One PDF that contains the following sections:

- Introduction
- Problem statement and specifications



- Motivation
- Solution design using a logic design tool that you studied in the previous logic design courses and HDL tool
- Stick diagram for each component of your design. The building blocks components are enough.
- Testing strategy and results: they should show instructions to simulate and verify your design, by including Linux terminal commands for Magic and Irsim used to run your project with few different inputs.

2- A compressed folder containing:

- Source code and layout.