Computer Organization – HW1

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1. Divide your student ID by 4 and the remainder is the new ID in the following table. Dismiss NOT gate propagation delay and if there are any gates with more than 4 input in your design, assume the delay as a delay of 4 input gate.

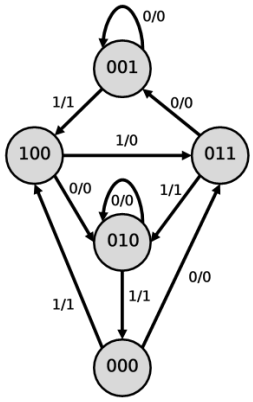
Delay	ID			
	0	1	2	3
TNAND2	1ns	2ns	1ns	1ns
TNAND3	2ns	3ns	3ns	2ns
TNAND4	3ns	5ns	5ns	4ns

   - Calculate total gate delay of a 32-bit Ripple Carry Adder.
   - Calculate total gate delay of a 32-bit Carry Look Ahead.

2. The state diagram of a Finite State Machine (FSM) is given below:
   a) Determine this machine's type. (Whether the following machine is a Mealy State Machine or Moor State Machine)

   b) Based on your answer in the previous section, convert the machine to other type.

   c) Construct the state transition table for the original machine.



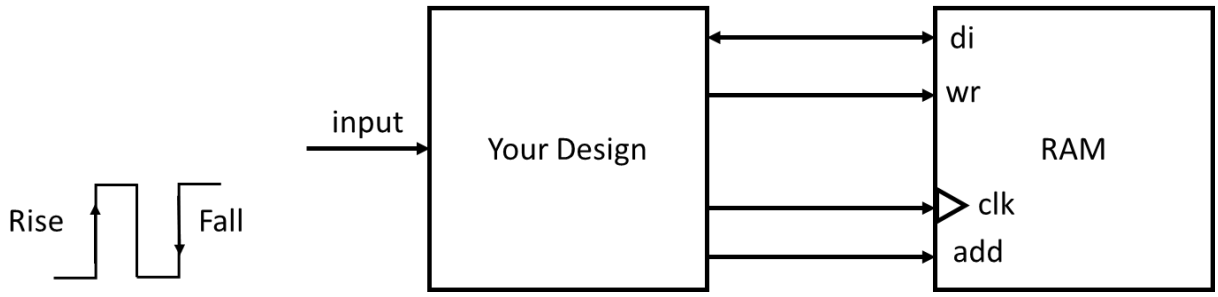
3. Design a circuit that computes the cube of the input (2 bits), using the minimum size possible ROM.

4. Design a circuit with the following conditions:
   - Input: 4-bit number A ($A_3A_2A_1A_0$)
   - Output: Output goes HIGH if A is a multiplier of 2 or 3.
   - Using only 8:1 Multiplexer.

5. In the following setup, we would like to design a circuit which will fill 16 cells of a 16-cell RAM in every clock cycle.

$$for\ (i = 0; i < 16; i++)$$
$$d[i] = i;$$

On the rising edge of the clock, the data is going to be fetched and prepared and on the falling edge of the clock, data will be written on the memory and this process will last at 16 clocks. Also we'd like to stop writing on the other cells of RAM after the end of the 16 clocks (even with receiving new clock signal).



- Why do we prepare data on rising edge and write on falling edge?
- Draw a schematic for your design and write a brief explanation for it.

6. Answer the following questions:
   a) What is FPGA? What is the difference of FPGA and microprocessor?
   b) What is ASIC design?
   c) What is VLSI (Very Large Scale Integration)?
   d) What are the common concepts between part a, b and c?

If you have any questions regarding this assignment, feel free to contact us.

Please submit your homework, simulations and projects in the following format:

Name_StudentNumber_HW1 (BillGates_12345678_HW1)

Good Luck!