Indian Institute of Technology Tirupati
CS4100: Computer System Design
QUIZ 1, B TECH IV, SEMESTER VII

Date:

Registration No.:

Name:

[Points: 20][Time: 60 min]

Instruction: *1) The set consists of 5 questions in total which sums up to score of 20 points. All the questions are mandatory for 20 points evaluation.*
2) Write your Registration Number and Name in the place provided in this question paper. The answers has to be written in the answer-sheets (do not to write anything in the question paper). The question paper has to be returned along with the answer-sheets.

1. Compute the one's complement of $(0000)_2$ and two's complement of $(0001)_2$ and comment on the results.
   [2 $points$, 6 $mins$]

2. Show using Boolean algebra how XOR gate can be used as an inverter or as a simple pass gate.
   [2 $points$, 6 $mins$]

3. Draw the circuit diagram of a mux-based D flip-flop with positive edge triggered clocking. Demonstrate the operation with suitable timing diagram showing Clock, D input and Q output.
   [5 $points$, 15 $mins$]

4. Arithmetic unit capable of performing 8 bit operations need to be designed. The unit should be able to implement the following operations: $x + y$, $x - y$, $y - x$, $2 * x$, and $2 * y$. The design should use two 8-way 2:1 multiplexors (Mux2Way8), three two input 8-way xor gates (Xor2Way8), and an 8-bit adder. For each operation decide on the value of control signals.
   [5 $points$, 15 $mins$]

5. Design a circuitry for 8 byte memory using 8-bit registers, where the address is decoded using a row decoder of size 2:4 and a column decoder of size 1:2. The circuit diagram should show the necessary input, output buses and control signals. The digram should clearly label each of the unit to indicate what it is and what is its size.
   [6 $points$, 18 $mins$]