Boise State University
Department of Electrical and Computer Engineering
EE 230 Digital Systems
Test 2, October 31, 2006

Name: _____ *Row #:* _____

Instructions: *Show all steps and logic circuits for full or partial credits. It is very important that you write clearly, so that your test can be graded appropriately and fairly. This is a closed book and closed notes test.*

1. Implement $f(x_1, x_2, x_3, x_4) = \sum m(0, 4, 8, 13, 14, 15)$, where x_1 is MSB and x_4 is LSB, using

a. One 4-input multiplexer and other necessary gates, and
b. 3-input LUTs only.

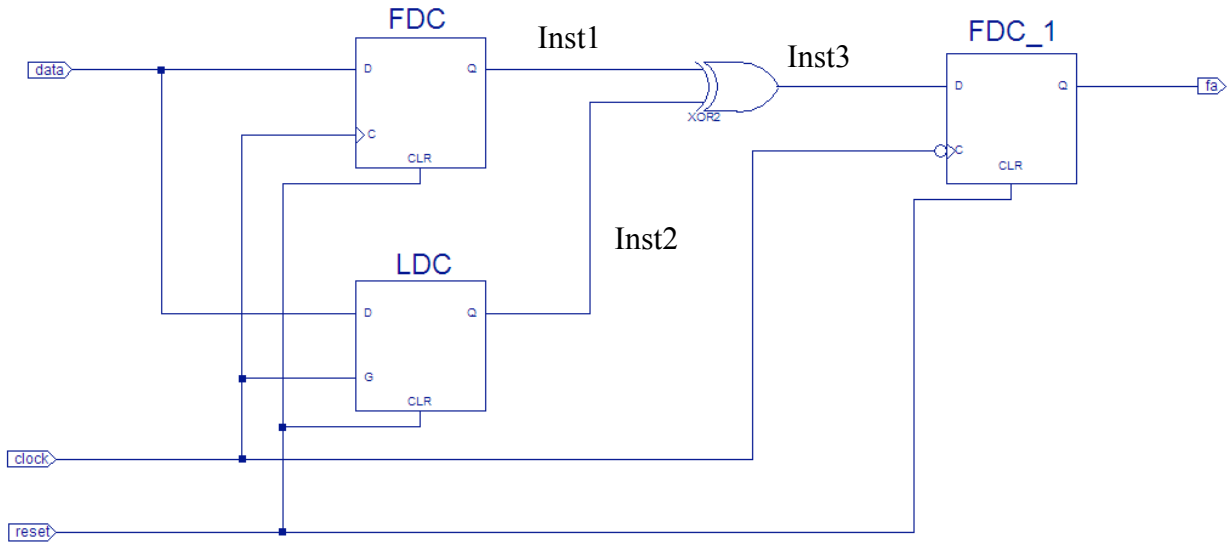
2. Convert the following numbers

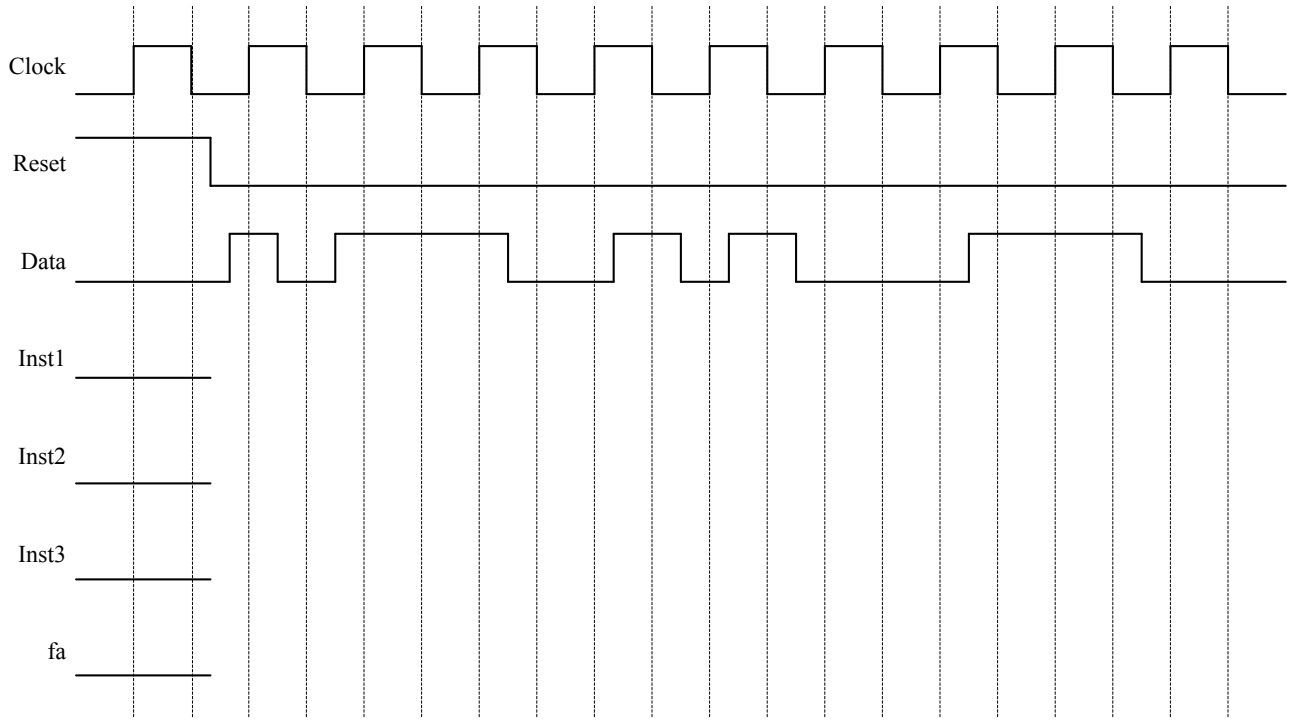
a. Convert $(123.3654)_{10}$ to binary representation,
b. Convert -93 to (8-bit) sign and magnitude, 1's complement, and 2's complement representations,
c. Convert $(9C)_{16}$ to decimal representation, and
d. Convert $(75)_8$ to decimal representation.

3. What is a ripple-carry adder? What is a carry-lookahead adder? Which adder has better performance? Which adder requires more gates to implement? Does performance directly related to logic resources required?

4. Design a logic circuit to convert 4-bit binary number (range 0 to F) to BCD (range 0 to 9) representation. Show how the BCD representation can be displayed to two seven-segment LEDs.

5. Complete the following timing diagram (see page 2) of the given logic circuit.




Clock
Reset
Data
Inst1
Inst2
Inst3
fa