Final exam DITE: Friday, January 14, 2011 -- 2:00 to 5:00 p.m.

Task I: Convert the following numbers from the given base to the other listed bases in the table.

Decimal	Binary	Octal	Hexadecimal
10.3125	?	?	?
?	11100101.101	?	?
?	?	623.5	?
?	?	?	A4D7.C

Important: Show and explain the conversion procedures you use and not only the final result.

Task II: Simplify the Boolean function $F(w,x,y,z) = \sum m(1,5,6,7,11,12,13,15)$ by finding all prime implicants and essential prime implicants and applying the selection rule. After you have simplified the function, represent it using the **logic basis NAND**. Also, draw the combinational logic circuit corresponding to the function **using only 2-input NAND gates.**
Important: Show all prime implicants and essential prime implicants as well as explain all the steps you do to simplify and represent function F(w,x,y,z).

Task III: Implement a binary Full Adder using a single 4-to-1 2-line multiplexer and a single XOR gate.
Important: Show and explain all the steps you do to implement the Full Adder.

Task IV: Design a Sequence Recognizer circuit that recognizes the occurrence of the sequence of bits "**110**", regardless of where it occurs in a longer sequence. This circuit has one input ***X*** and one output ***Z***. An arbitrary long input sequence of bits enters the circuit via input ***X***. Output ***Z*** equals to **1** when the previous three input bits to the circuit were **110**. Otherwise, ***Z*** equals to **0**.
Implement the circuit described above under the following conditions:

1. The Sequence Recognizer circuit **must be Moore Finite State Machine**;
2. Use **only** NOR gates and JK Flip-Flops.

Important: Show and explain all the steps you do to design and implement the Sequence Recognizer circuit.