Example of Exam for the DITE course

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

Decimal	Binary	Octal	Hexadecimal
13.3125	?	?	?
?	10100111.101	?	?
?	?	532.6	?
?	?	?	D7A4.C

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

Task II: Simplify the Boolean function F1(w,x,y,z) = ∑m(0,1,2,4,5,10,11,13,15) by finding all prime implicants and essential prime implicants and applying the selection rule. After you have simplified the function, represent it using the l**ogic basis NOR**. Also, draw the combinational logic circuit corresponding to the function **using only 2-input NOR gates.**
Important: Show all prime implicants and essential prime implicants as well as explain all the steps you do to simplify and represent function F1(w,x,y,z).

Task III: Let be given the Boolean function F2(w,x,y,z) = Σm(4,5,12,13).
Implement F under the following conditions:

1. Use **only** multiplexers 2-to-1 (**gates must not be used**!);
2. The number of multiplexers used in your implementation **must be as small as possible**.

Important: Show and explain all the steps you do to implement F2(w,x,y,z).

Task IV: Design a Sequence Recognizer circuit that recognizes the occurrence of the sequence of bits "**011**", 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 **0** when the previous three input bits to the circuit were **011**. Otherwise, ***Z*** equals to **1**.
Implement the circuit described above under the following conditions:

1. The Sequence Recognizer circuit **must be Moore Finite State Machine**;
2. Use **only** NAND gates and T Flip-Flops.

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