# Example of Exam for the FDSD 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.