Final exam DITE: Monday, January 11, 2016 -- 14:00 to 17:00h

Task I (4 points): Convert the following numbers from the given base to the other listed bases in the table.

Decimal	Binary	Octal	Hexadecimal
10.3125	?	?	?
?	10011101.101	?	?
?	?	623.5	?
?	?	?	7AFD.6

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

Task II (5 points): A combinational circuit is defined by the following three Boolean functions:
F1 = (X+Z)' + XYZ
F2 = (X+Z)' + X'YZ
F3 = (X+Z)' + XY'Z
Implement the circuit using two 2-to-4 Decoders with enable and external NAND gates.
Important: Show and explain all the steps you do.

Task III (6 points): 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 SR Flip-Flops.

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

Task IV (5 points): Simplify the Boolean function **F**(W,X,Y,Z) = ∑m(1,2,4,5,6,8,9) which has the don't-care conditions **d**(W,X,Y,Z) = ∑m(10,11,14,15) by finding all prime implicants and essential prime implicants and applying the selection rule. Note that function **F** has ***don't care*** conditions **d** that you have to take into account when simplifying function **F**. After you have simplified the function, represent it using the **logic 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 F.

NOTE: The exam grade is equal to the obtained number of points divided by 2!