

**Midterm exam DITE:** Monday, October 24, 2011 -- 1:45 to 4:45 p.m.

**Task I:** Simplify the following Boolean function 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 mentioned below. Also, draw the combinational logic circuit corresponding to the function in the corresponding logic basis using logic gates.

$$F(w,x,y,z) = \Sigma m(0,1,4,5,7,8,9,12,14,15)$$

Logic basis NAND and draw it using only 2-input NAND gates

**Note:** Show all prime and essential prime implicants.

**Task II:** A combinational circuit is defined by the following three Boolean functions:

$$F1 = (X+Z)' + XYZ$$

$$F2 = (X+Z)' + X'YZ$$

$$F3 = (X+Z)' + XY'Z$$

Design the circuit with a single 4-to-1\_3-line Multiplexer and one XOR gate.

**Task III:** Design a 4-to-1 Multiplexer using two 2-to-1 Multiplexers with enable and three NOR gates.

**Important:** For all three tasks do not forget to show how you got the results.