



Digital Systems Wintersemester 2017/2018

Serie 5

Issue date: Monday, 27.11.2017

Submission date: Monday, 11.12.2017, 12 PM

Presentation tasks

Task

Let the following functions x and y be given by the following minimal forms:

$$x = b + \bar{s}\bar{a} + sa$$

$$y = (a + s) \cdot (s + \bar{b}) \cdot (\bar{s} + \bar{a} + b)$$

- Represent x as a combinatorial circuit made exclusively of NAND-gates.
- Represent y as a combinatorial circuit made exclusively of NOR-gates.
- Create a CMOS gate for each output function. Use as few transistors as possible.

Homework

Task 1

Minimize the following function f_1 using the Quine and McCluskey method:

$$f_1 = abd + \bar{a}\bar{b}\bar{c}\bar{d} + \bar{a}\bar{b}c + b\bar{c}\bar{d} + abc\bar{d} + \bar{a}\bar{c}d$$

30 Points

Task 2

Based on the diagram shown in Figure 1, use the following guidelines to complete this task.

- Create the complete function table for the circuit.
- Minimize the **disjunctive** normal form of y_1 and the **conjunctive** normal form of the output function y_0 using Karnaugh maps.
- Represent y_0 as a combinatorial circuit, made **exclusively** of NOR gates.
- Represent y_1 as a combinatorial circuit, made **exclusively** of NAND gates.
- Create a CMOS gate for both y_0 and y_1 . Use as few transistors as possible.

10, 20, 10, 10, 20 points

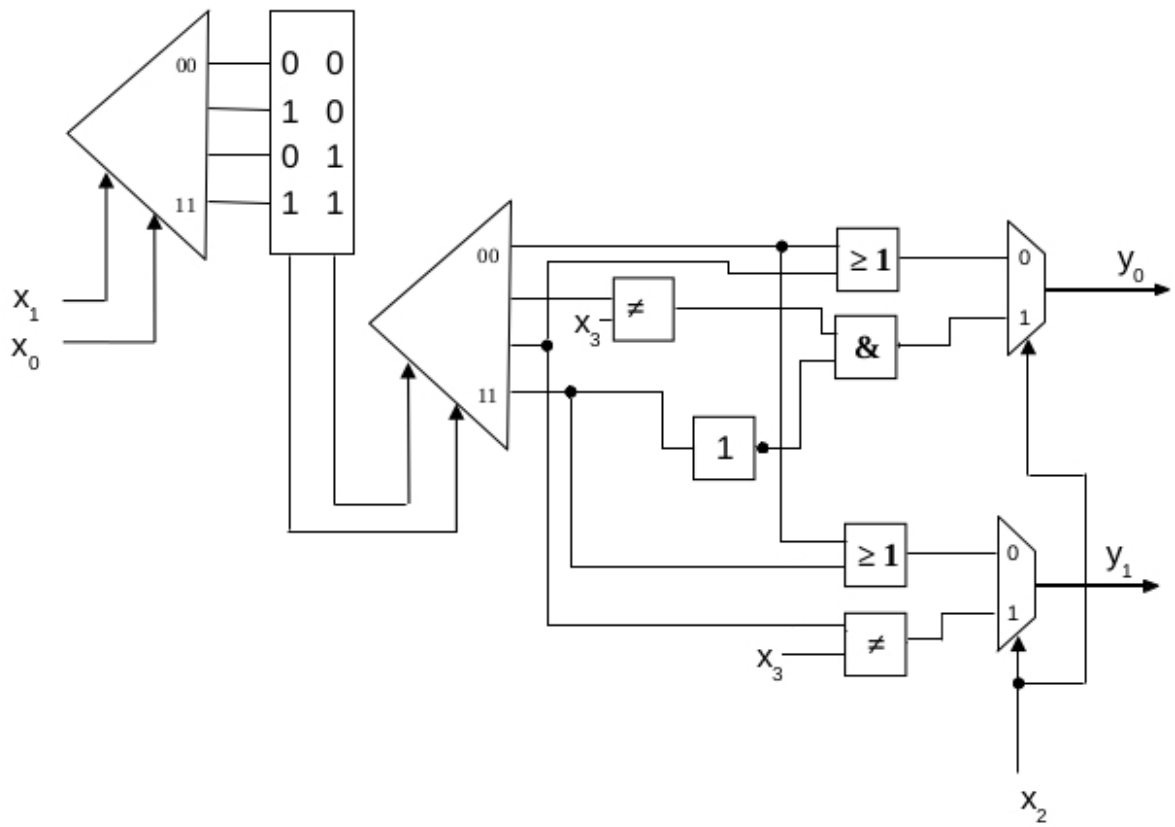


Figure 1: circuit