

University of Illinois at Urbana-Champaign
Department of Electrical and Computer Engineering

ECE 362/CS 362/MATH 391 : LOGIC DESIGN

Spring 2002

Problem Set 5

Iterative Consensus, Multiple-Output PLA, Hazards

Issued: Thursday, February 14th.

Due: Thursday, February 21st.

Reading from McCluskey: Chapter 6, Sections 6.3–6.10, Chapter 3, Section 3.6.

Announcement: The first Mid-Semester Exam will be held on Tuesday, February 26th, from 7:00 to 9:00pm in Room 141 Loomis Laboratory. The exam will cover all material from the beginning of the term *up to and including* the lecture on Thursday, February 21st. The corresponding material includes (but is not limited to) Problem Sets 1 through 5 and the following material from McCluskey: Chapter 2 (2.1-2.8), Chapter (3.1-3.6), Chapter 6 (6.1-6.10).

During the exam, you can bring an 8.5×11 -inch double-sided sheet of *handwritten* notes. Calculators are allowed but will not be necessary.

A copy of an old exam can be downloaded from <http://courses.ece.uiuc.edu/ece362>. This exam does not necessarily resemble this year's exam (also notice that the material covered in this old exam is slightly different from the material covered in this year's exam).

Problem 5.1

Obtain a complete sum using iterative consensus (first Tison method) for the following functions:

(a) $f(a, b, c, d, e) = a'bce' + a'c'de + ade' + ab'de + bde$

(b) $f(u, v, w, x, y, z) = uxyz' + vxz + v'yz + w'xyz + w'xz'$

(c) $f(t, u, v, w, x, y, z) = t'wx' + twy + uwx + uxy' + vxz + uwx'y + wx'yz$

Problem 5.2

Problem 6.16 from McCluskey. Use iterative consensus to find the prime implicants. Apply algebraic simplification on the corresponding Petrick expression (along with column/row eliminations) to find a minimal sum.

Problem 5.3

A function receives two 3-bit binary numbers $A = A_2A_1A_0$ and $B = B_2B_1B_0$ as inputs and evaluates to 1 whenever $A > B$. Use iterative consensus to obtain the prime implicants for this function.

[Hint: You can start from the following “functional description” of f

$$\begin{aligned} f = & A_2B_2' + \\ & A_2B_2A_1B_1' + A_2'B_2'A_1B_1' + \\ & A_2B_2A_1B_1A_0B_0' + A_2B_2A_1'B_1'A_0B_0' + \\ & A_2'B_2'A_1B_1A_0B_0' + A_2'B_2'A_1'B_1'A_0B_0' \end{aligned}$$

and use iterative consensus to reach the prime implicants.]

Problem 5.4 (Optional)

Problem 6.23 from McCluskey (fold as best as you can by inspection).

Problem 5.5

Problem 3.8 from McCluskey.