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

ECE 362/CS 362/MATH 391 : Logic Design

Spring 2002

Problem Set 4

Tagged Tabulation, Prime Implicant Tables, Petrick Expressions

Issued: Thursday, February 7th. **Due:** Thursday, February 14th.

Reading from McCluskey: Chapter 6, Sections 6.3–6.8.

Problem 4.1

Problem 6.13 (parts (b) and (c) only) from McCluskey.

Problem 4.2

Repeat problem 6.14 from McCluskey, this time using the tagged tabulation procedure. (Hint: During the prime implicant generation procedure "don't care" terms ("d's") are treated as "1's".) Build a prime implicant table, use it to identify the essential multiple-output prime implicants, and then obtain a minimal two-stage multiple output network by considering the remaining prime implicants.

Problem 4.3

Problem 6.17 from McCluskey.

Problem 4.4

Problem 6.18 from McCluskey.

Problem 4.5

The function $f(v,w,x,y,z) = \sum(1,3,6,7,12,13,14,15,17,22,25,28,29,30)$ has the following prime implicants (shown next to the minterms they cover):

$A = v'xy$:	$6,7,14,15$	$F = v'w'x'z$:	$1,3$
$B = xyz'$:	$6,14,22,30$	$G = w'x'y'z$:	$1,17$
$C = v'wx$:	$12,13,14,15$	$H = v'w'yz$:	$3,7$
$D = wxy'$:	$12,13,28,29$	$I = vx'y'z$:	$17,25$
$E = wxz'$:	$12,14,28,30$	$J = vwy'z$:	$25,29$

(a) Build the prime implicant table and use it to find the essential prime implicants.

(b) Obtain a Petrick expression and use algebraic simplification to obtain a minimal sum.

Problem 4.6

Consider the function $f(v, w, x, y, z) = \sum(2, 6, 14, 17, 18, 25, 26, 29, 30, 31)$.

(a) Use Quine-McCluskey tabulation to determine the prime implicants of f.

(b) Build a prime implicant table and use it to obtain the essential prime implicants of f.

(c) Use Petrick's method to obtain all minimal sums for f.