Due: Thursday, November 18, 2003

1. (10 points) Question 3.9, page 96, Murdocca & Heuring

2. (10 points) Question 3.14, page 97, Murdocca & Heuring

3. (10 points) Question A.12, page 494, Murdocca & Heuring

4. (50 points) In the following, the notation \( \sum m(x_1, \ldots, x_j) \) indicates a Boolean function that is the sum of the minterms \( x_1, \ldots, x_j \), where \( x_i \) is the \( i \)th minterm in canonical ordering — i.e., the \( i \)th row of the truth table where the input values are ordered as binary numbers. Similarly,

\[
\sum m(x_1, \ldots, x_j) + d(y_1, \ldots, y_k)
\]

indicates a Boolean function that is the sum of the minterms \( x_1, \ldots, x_j \) and whose values for rows \( y_1, \ldots, y_k \) of the truth table are don’t cares.

Minimize the following functions using Karnaugh maps. Then, write down a Boolean formula in sum-of-products or product-of-sums form for each function. Show your work (including the Karnaugh maps).

(a) \( f(A, B, C, D) = \sum m(0, 1, 2, 8, 9, 14, 15) \)
(b) \( f(A, B, C, D) = \sum m(0, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 15) \)
(c) \( f(A, B, C, D) = \sum m(2, 3, 4, 5, 6, 7, 8, 9, 10, 13) \)
(d) \( f(A, B, C, D) = \sum m(4, 12, 13, 14, 15) + d(0, 3, 5, 8) \)
(e) \( f(A, B, C, D) = \sum m(0, 2, 4, 8, 10, 12, 13) + d(5, 14, 15) \)