

**University of California at Berkeley**  
**College of Engineering**  
**Department of Electrical Engineering and Computer Sciences**

EECS150  
 Spring 2000

J. Wawrzynek  
 E. Caspi

Quiz #8 – Solution

- (a) The canonical *sum-of-products* or *minterm* expression for  $f$  is an OR (sum) of AND (product) terms, one AND term for each 1-valued entry in the truth table:

$$f = a'b'c'd' + a'b'cd' + a'bcd + ab'c'd' + ab'cd' + abc'd' + abcd' + abcd$$

- (b) We fill the Karnaugh map for  $f$  using values from the truth table. To find the reduced expression, we cover all 1's in the map using the fewest, largest rectangles of size  $(2^n \times 2^m)$ . The reduced expression is a sum of products, one product per rectangle:

$$f = b'd' + ad' + bcd$$

|    |    |    |    |    |    |
|----|----|----|----|----|----|
|    |    | cd |    |    |    |
|    |    | 00 | 01 | 11 | 10 |
| ab | 00 | 1  | 0  | 0  | 1  |
|    | 01 | 0  | 0  | 1  | 0  |
|    | 11 | 1  | 0  | 1  | 1  |
|    | 10 | 1  | 0  | 0  | 1  |