CSCE 211 CHAPTER 3 PROBLEM ASSIGNMENT DUE: OCT 06 2025

You must show **all** your work! Answers without supporting work will not be given credit. Illegible work falls under the *Intended Purpose* policy. Submissions crowded together on a single page will not be graded. Unclear answers will not be graded. All problems are taken from or inspired by our *Introduction to Logic Design* **3rd** *Edition* text.

Points: 10

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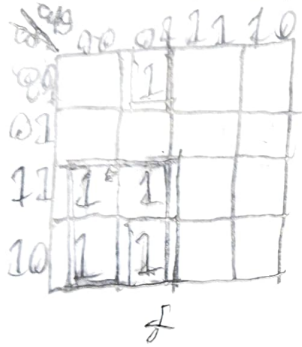
1. Find all minimum SoP expressions for the following functions:

   (a) $f(a,b,c,d) = \Sigma m(2,3,4,6,7)$. 2T5L. (0.5 points)



Answer: $f = a'c + a'bd'$

   (b) $f(a,b,c,d) = \Sigma m(0,1,2,5,7,8,10,15)$, 3T8L. (0.5 points)

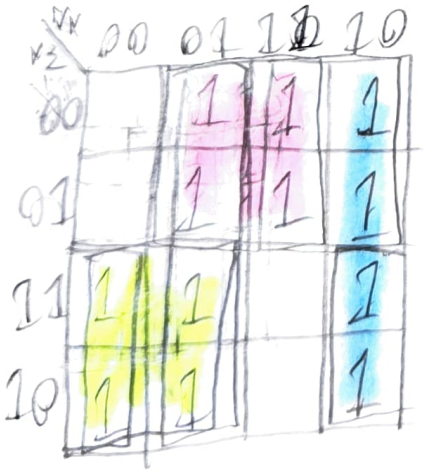
Answer: $f = b'd' + a'c'd' + bcd$

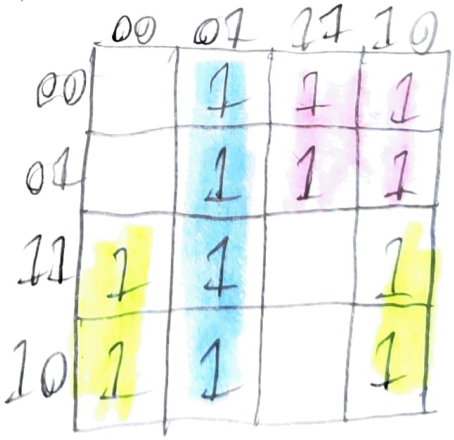
(c) $h(a,b,c,d) = \Sigma m(1,3,5,6,7,9,11,12,13,14)$. 4T10L. Two SoP expressions. (0.75 points)

Answer: $h = b'd + c'd + ab'd' + a'bc$

Answer: $h = b'd + a'd + bcd' + ab'c'$

(d) $f(w,x,y,z) = \Sigma m(2,3,4,5,6,7,8,9,10,11,12,13)$, 3T6L. Two SoP expressions. (0.75 points)





Answer: $f = w'y + xy' + wx'$

Answer: $f = x'y + wy' + w'x$

Cont.

2. Given the function

$f(a, b, c, d) = \Sigma m(0, 2, 4, 7, 8, 10, 12, 14, 15)$,

(a) List all prime implicants (1.0 points),

Answer: bcd, c'd, ad', b'd', abc

(b) List only the essential prime implicants. and (1.0 points)

Answer: bcd, c'd'

(c) Give the minimum SoP expression, 4T9L. (0.5 points)

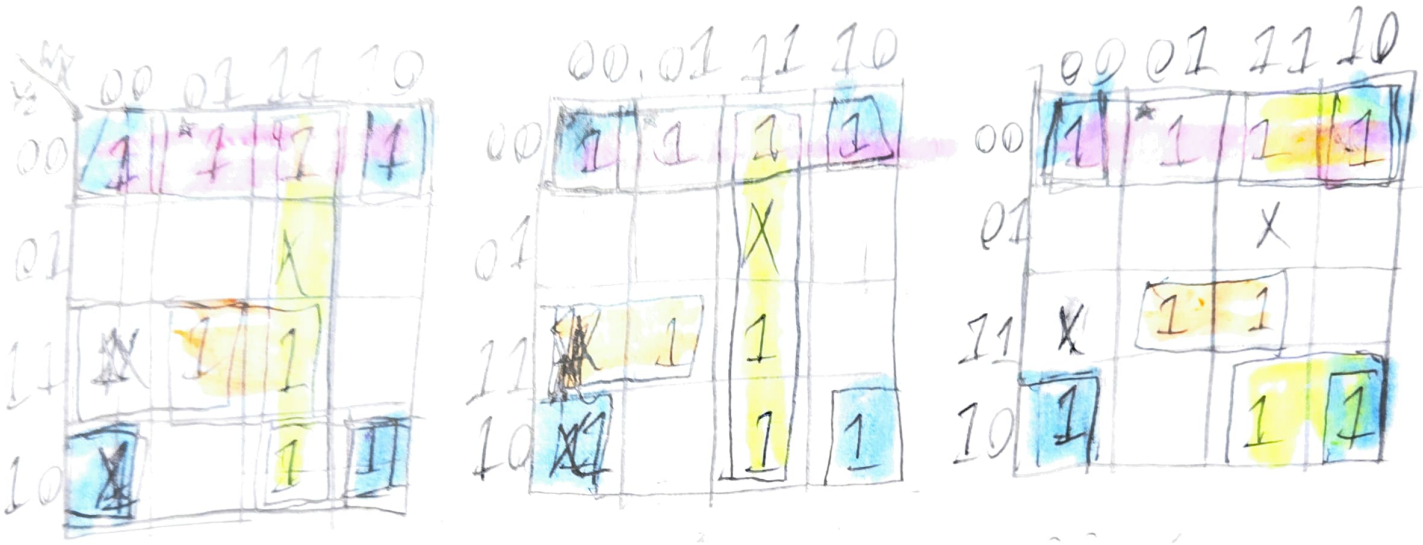
Answer: f = bcd + c'd' + ad' + b'd'

Cont.

3. Given the function

$f(w, x, y, z) = \Sigma m(0, 2, 4, 7, 8, 10, 12, 14, 15) + \Sigma d(3, 13)$,

Find three minimum SoP expressions, 4T9L. (2.5 points)



Answer: $f = y'z' + Wx + x'z' + xyz$

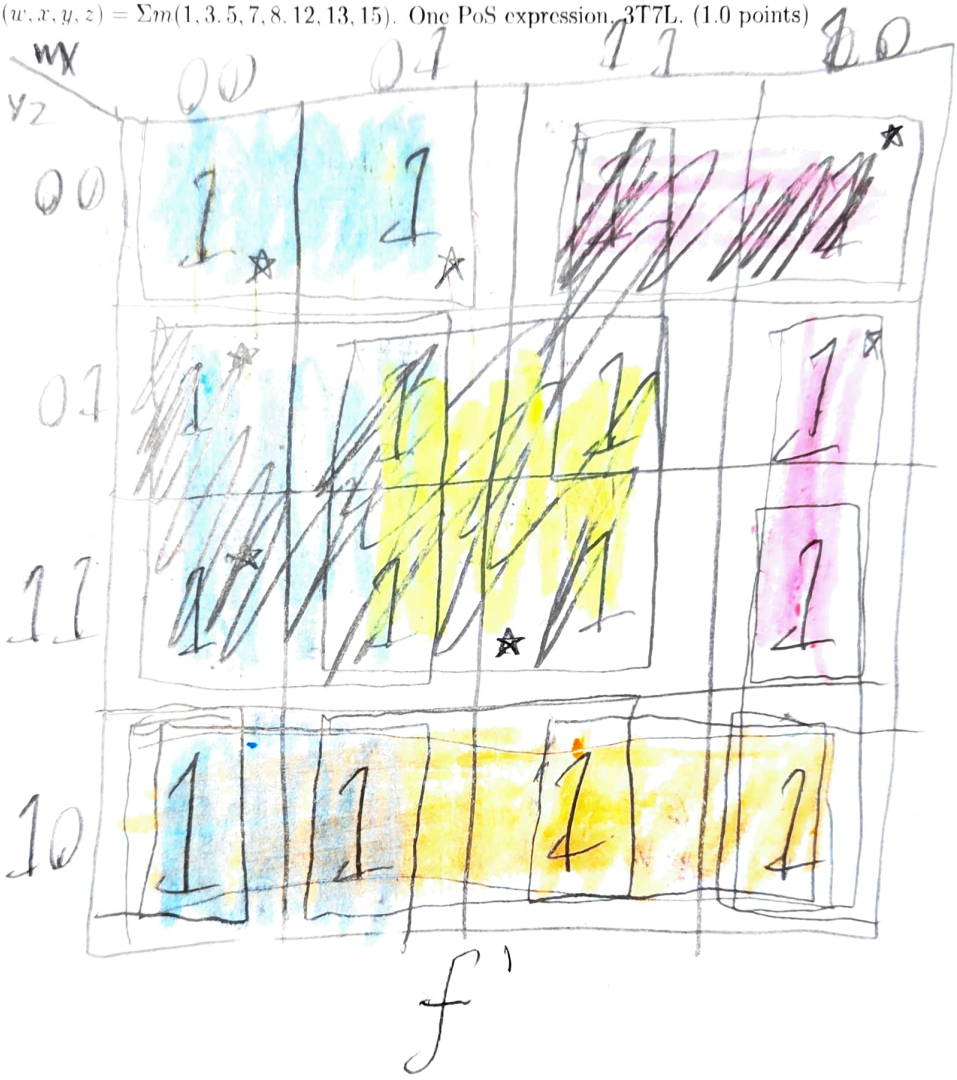
Answer: $f = y'z' + Wx + x'z' + w'yz$

Answer: $f = y'z' + Wz + x'z' + xyz$

Cont.

4. For each of the following functions, find the indicated minimum PoS expressions.

(a) $f(w,x,y,z) = \Sigma m(1,3,5,7,8,12,13,15)$. One PoS expression, 3T7L. (1.0 points)

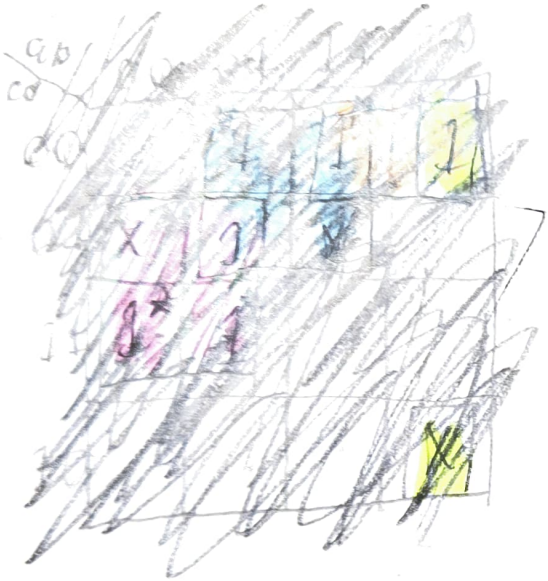


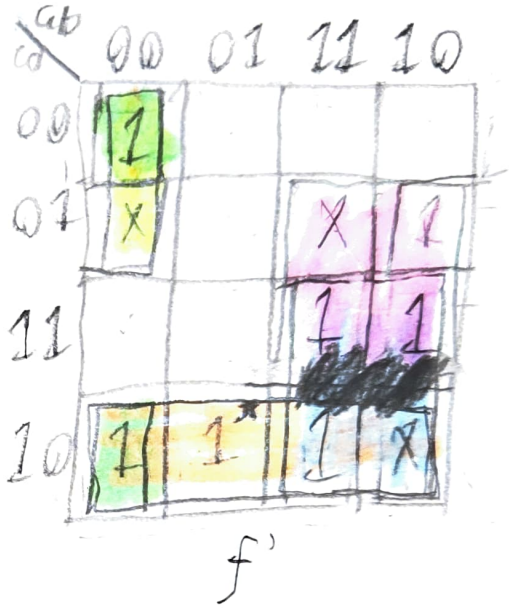
f' W'Z' + WX'Z + YZ'

f (W+Z)(W'+X+Z')(Y'+Z)

Cont.

(b) $f(a,b,c,d) = \Sigma m(3,4,5,7,8,12) + \Sigma d(1,10,13)$. Two PoS expressions, 3T7L. (1.5 points)





g_1 $cd' + ad + a'b'c'$

g_1 $(c'+d)(a'+d')(a+b+c)$

g_2 $cd' + ad + a'b'd'$

g_2 $(c'+d)(a'+d')(a+b+d)$

The End.