

Homework 2&3 mistakes report

As seen from the below picture the student are not considering the inverse of the term when taking POS. I find this to be a common mistake. The below question is from question 8 from Assignment 3

Problem 8 Find the minimum-cost SOP and POS forms for the function $f(x_1, x_2, x_3, x_4) = \sum m(2, 8, 9, 12, 15) + D(1, 3, 6, 7)$. Chose the minimum-cost expression by comparing POS and SOP forms. [10 marks]

8.

	x_1	x_2	x_3	x_4
0	0	1	1	1
1	0	0	1	1
2	1	1	0	0
3	1	0	0	0
4	0	1	1	0
5	0	0	1	0
6	1	1	1	0
7	1	0	1	0
8	0	1	0	1
9	0	0	0	1
10	1	1	0	1
11	1	0	0	1
12	0	1	1	1
13	0	0	1	1
14	1	1	1	1
15	1	0	1	1

POS $\rightarrow (\bar{x}_1 + \bar{x}_2) \cdot (x_1 + \bar{x}_2 + x_3) \cdot (x_1 + x_3 + \bar{x}_4)$
 $\cdot (x_2 + \bar{x}_3 + x_4) = \{1, 2, 3, 4, 5, 6, 7, 8\} = 25$

SOP $\rightarrow (\bar{x}_1, x_2) + (x_2, x_3, x_4) + (x_1, x_3, \bar{x}_4)$
 $+ (x_1, \bar{x}_2, \bar{x}_3) = \{1, 2, 3, 4, 5, 6, 7, 8\} = 25$

Same cost so POS = SOP

Problem 3 Implement the function in Table 1 using only NAND gates. [10 marks]

The students are confused with the notations of SOP and POS as demonstrated below. The below is question 3 from assignment 3

3

	x_1, x_2	00	01	11	10
0	x_3	0	1	0	1
1	x_3	1	0	1	0

$f = \bar{x}_1 \bar{x}_2 x_3 + \bar{x}_1 x_2 \bar{x}_3 + x_1 x_2 x_3 + x_1 \bar{x}_2 \bar{x}_3$
 $= \bar{x}_1 (\bar{x}_2 x_3 + x_2 \bar{x}_3) + x_1 (\bar{x}_2 \bar{x}_3 + x_2 x_3)$
 $= \bar{x}_1 (\underbrace{\bar{x}_2 x_3 + x_2 \bar{x}_3}_A) + x_1 (\underbrace{\bar{x}_2 \bar{x}_3 + x_2 x_3}_A)$

The below picture illustrates the same issue outlined above. Question 4 assignment 3

Problem 4 Implement the function in Table 1 using only NOR gates. [10 marks]

$$\begin{aligned}
 4 \quad f &= \overline{\overline{x_1}(x_2 + x_3)} + \overline{\overline{x_1}(x_2 \cdot x_3)} \\
 &= \overline{x_1 + \overline{x_2 + x_3}} + \overline{x_1 + \overline{x_2 \cdot x_3}} \\
 &= \underbrace{\overline{x_1 + (x_2 \cdot x_3)}}_A + \underbrace{\overline{\overline{x_1} + (x_2 + x_3)}}_B
 \end{aligned}$$

The students are confused about algebraic simplification and when to apply the simplification laws. The below is from problem 3 from assignment 3

Problem 3

	x_1			
	0	1	0	1
x_3	1	0	1	0
	x_2			

$$\begin{aligned}
 &x_1 \overline{x_2} \overline{x_3} + x_1 x_2 \overline{x_3} + \overline{x_1} x_2 \overline{x_3} + \overline{x_1} \overline{x_2} x_3 \\
 &\overline{x_3} x_2 + \overline{x_3} x_1 + \overline{x_1} \overline{x_2} x_3
 \end{aligned}$$

Some students are performing inverse of f to find POS from SOP as shown below which is problems 3,4 from assignment 3

$$F = \overline{A} \overline{B} C + \overline{A} B \overline{C} + A \overline{B} \overline{C} + ABC \Rightarrow (A + B + \overline{C}) \cdot (A + \overline{B} + C) \cdot (\overline{A} + B + C) \cdot (\overline{A} \overline{B} \overline{C})$$

Some students are still confused about De-Morgan's laws as shown below problems from assignment 2 and 3

Problem 1 If the SOP form for $\overline{f} = ABC + \overline{A}\overline{B}$, then give the POS form for f . [10 marks]

$$\text{SOP: } \overline{f} = ABC + \overline{A}\overline{B}$$

$$f = \overline{\overline{A}\overline{B}C} + \overline{AB}$$

Problem 1 Use algebraic manipulation to simplify the function $f = x_1x_3 + x_1x_2 + \overline{x}_1x_2x_3 + \overline{x}_1\overline{x}_2\overline{x}_3$.
[10 marks]

Problem 1. $f = x_1 \cdot x_3 + x_1 \cdot x_2 + \overline{x}_1 \cdot x_2 \cdot x_3 + \overline{x}_1 \cdot \overline{x}_2 \cdot \overline{x}_3$

step #1: Apply De Morgan's Theorem $\rightarrow (\overline{x_1 \cdot x_2 \cdot x_3}) = \overline{x_1} + \overline{x_2} + \overline{x_3}$

$f = x_1 \cdot x_3 + x_1 \cdot x_2 + \overline{x}_1 \cdot x_2 \cdot x_3 + \overline{x}_1 + \overline{x}_2 + \overline{x}_3$

They are using the notation of replacing the ones with zeros (Not sure about the validity of such convention). The below is from problem 8 of assignment 3

SOP

$x_3 \backslash x_1 x_2$	00	01	11	10
00	0	0	1	1
01	X	0	0	1
11	X	X	1	0
10	1	X	0	0

x_2

POS

$x_3 \backslash x_1 x_2$	00	01	11	10
00	1	1	0	0
01	X	1	1	0
11	X	X	0	1
10	0	X	1	1

$f =$