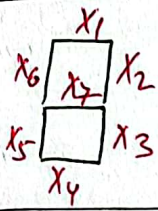


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 Digital Logic Design
 Assignment 1 / Spring 2024

Solution 1



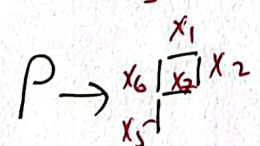
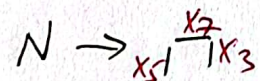
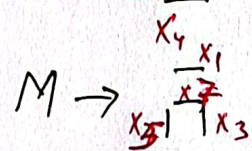
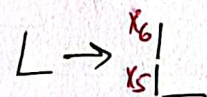
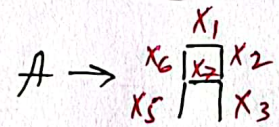
The notations are for the common parts that the letters share.

We design a combinational circuit that takes 3 bit binary input and shows the corresponding letter of my "Name Surname" in 7 segment display according to the given figures.

In our case the letters are; L A M A N P A

The Truth table;

abc	x_1	x_2	x_3	x_4	x_5	x_6	x_7
000	0	0	0	0	0	0	0
L 001	0	0	0	1	1	1	0
A 010	1	1	1	0	1	1	1
M 011	1	0	1	0	1	0	1
A 100	1	1	1	0	1	1	1
N 101	0	0	1	0	1	0	1
P 110	1	1	0	0	1	1	1
A 111	1	1	1	0	1	1	1



NOW, we construct Karnaugh maps for each variables.

$x_1(a, b, c) =$ $b + ac'$

$x_2(a, b, c) =$ $ac' + bc' + ab$

$$x_3(a, b, c) = a \begin{array}{|c|c|c|c|} \hline 0 & 0 & 1 & 1 \\ \hline 1 & 1 & 1 & 0 \\ \hline \end{array} \quad ab' + bc + a'b$$

$$x_4(a, b, c) = a \begin{array}{|c|c|c|c|} \hline 0 & 1 & 0 & 0 \\ \hline 0 & 0 & 0 & 0 \\ \hline \end{array} \quad a'b'c$$

$$x_5(a, b, c) = a \begin{array}{|c|c|c|c|} \hline 0 & 1 & 1 & 1 \\ \hline 1 & 1 & 1 & 1 \\ \hline \end{array} \quad a + c + b$$

$$x_6(a, b, c) = a \begin{array}{|c|c|c|c|} \hline 0 & 1 & 0 & 1 \\ \hline 1 & 0 & 1 & 1 \\ \hline \end{array} \quad ac' + ab + bc' + a'b'c$$

$$x_7(a, b, c) = \begin{array}{|c|c|c|c|} \hline 0 & 0 & 1 & 1 \\ \hline 1 & 1 & 1 & 1 \\ \hline \end{array} \quad b + a$$

7-segment display

x_7, x_6, x_1, x_2

+

x_5, x_4, x_3

Circuit

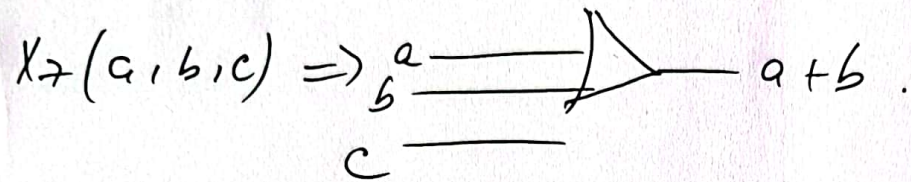
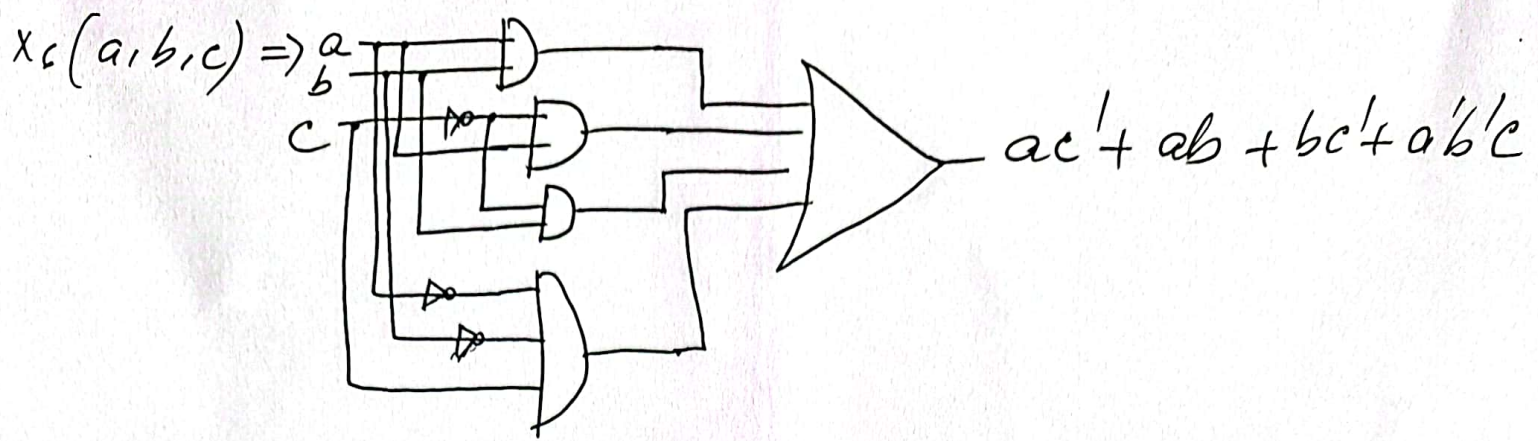
$$x_1(a, b, c) \Rightarrow \begin{array}{c} b \\ a \\ c \end{array} \quad \begin{array}{c} \text{AND} \\ \text{OR} \end{array} \quad b + ac'$$

$$x_2(a, b, c) \Rightarrow \begin{array}{c} a \\ b \\ c \end{array} \quad \begin{array}{c} \text{AND} \\ \text{AND} \\ \text{AND} \\ \text{OR} \end{array} \quad ac' + bc' + ab$$

$$x_3(a, b, c) \Rightarrow \begin{array}{c} a \\ b \\ c \end{array} \quad \begin{array}{c} \text{AND} \\ \text{AND} \\ \text{AND} \\ \text{OR} \end{array} \quad ab' + bc + a'b$$

$$x_4(a, b, c) \Rightarrow \begin{array}{c} a \\ b \\ c \end{array} \quad \text{AND} \quad a'b'c$$

$$x_5(a, b, c) \Rightarrow \begin{array}{c} a \\ b \\ c \end{array} \quad \text{OR} \quad a + b + c$$



In the end, we complete the tasks by combining all 7 circuits in the .circ file (LogicSim).