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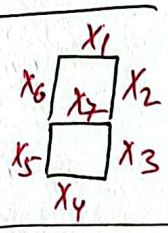
Digital Logic Design
Assignment 1 / Spring 2024

Solution:

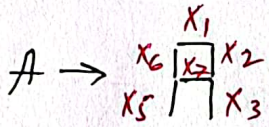


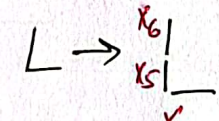
The notations are for the common parts that the letters share.

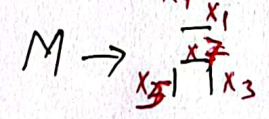
We design a combinational circuit that takes 3 bit binary input and shows the corresponding letter of my "Name Surname" in 7 segment display according to the given figures.
In our case the letters are; **LAMANPA**

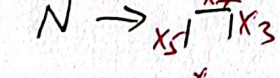
The Truth table;

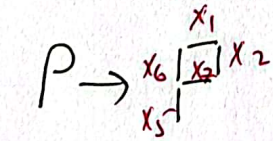
abc	X_1	X_2	X_3	X_4	X_5	X_6	X_7
000	0	0	0	0	0	0	0
L 001	0	0	0	1	1	1	0
A 010	1	1	1	0	1	1	1
M 011	1	0	1	0	1	0	1
A 100	1	1	1	0	1	1	1
N 101	0	0	1	0	1	0	1
P 110	1	1	0	0	1	1	1
A 111	1	1	1	0	1	1	1

A → 

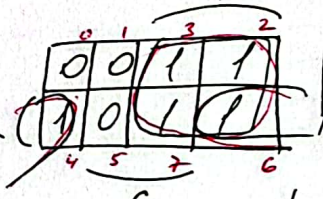
L → 

M → 

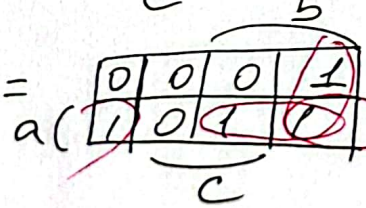
N → 

P → 

Now, we construct Karnaugh maps for each variables.

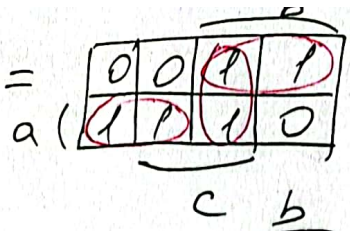
$X_1(a,b,c)$ = 

$b + ac'$

$X_2(a,b,c)$ = 

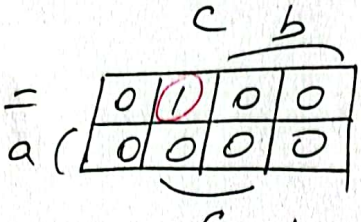
$ac' + bc' + ab$

$X_3(a,b,c)$ =



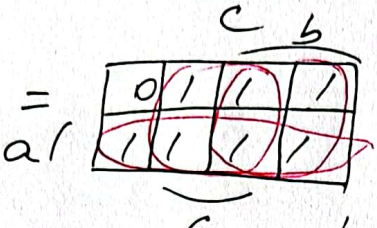
$ab' + bc + ab$

$X_4(a,b,c)$ =



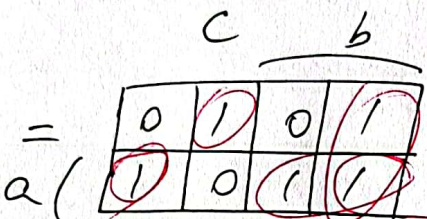
$a'b'c$

$X_5(a,b,c)$ =



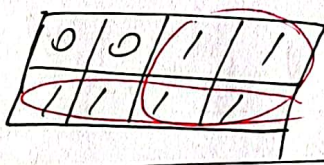
$a + c + b$

$X_6(a,b,c)$ =



$ac' + ab + bc' + a'b'c$

$X_7(a,b,c)$ =



$b + a$

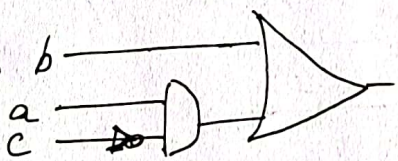
7-Segment Display

$X_7 X_6 X_1 X_2$

$X_5 X_4 X_3$

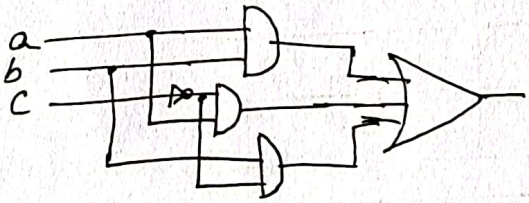
Circuit

$X_1(a,b,c) \Rightarrow$



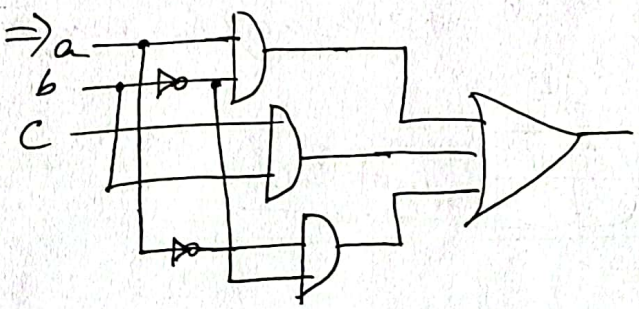
$b + ac'$

$X_2(a,b,c) \Rightarrow$



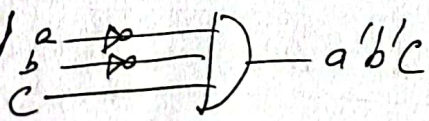
$ac' + bc' + ab$

$X_3(a,b,c) \Rightarrow$



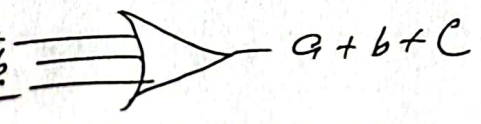
$ab' + bc + a'b.$

$X_4(a,b,c)$



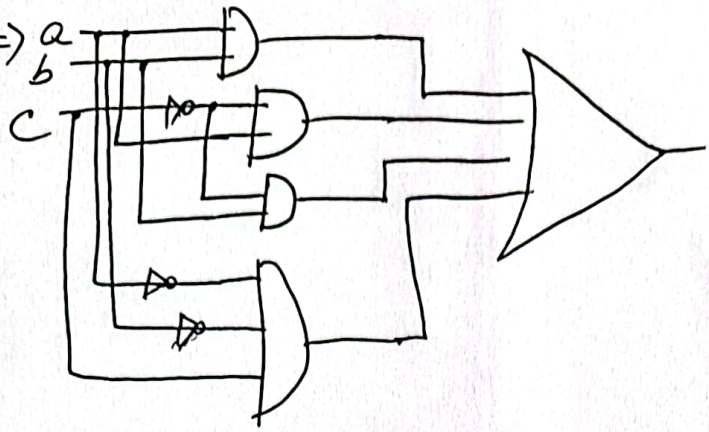
$a'b'c$

$X_5(a,b,c)$



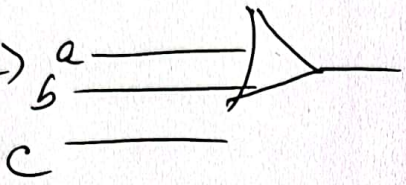
$a + b + c$

$X_6(a,b,c) \Rightarrow$



$ac' + ab + bc' + a'b'c$

$X_7(a,b,c) \Rightarrow$



$a + b$.

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