

Lab. Script 5

Summing Circuit

- Design a digital system that is able to implement the sum C of two binary variables A and B taking into consideration a possible carry bit T , i.e.

$$C = A + B + T, \quad A, B, T \in \mathcal{B}$$

The circuit must have three inputs and one output. The inputs will be the variables A and B besides the additional carry bit T . The output $C = [c_1 \ c_0]$ will reflect the result of the sum of all the input variables. Draw the logical diagram and assemble it in a breadboard and verify its operation.

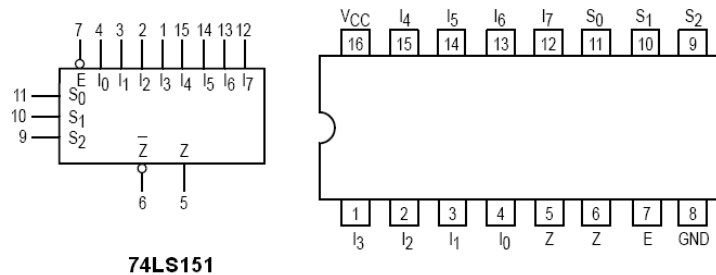
- (homework) Using MULTISIM expand the above circuit in order to implement the sum of two string of two bits each. Show that this circuit can be used to do subtractions if they are coded using two's complement.

Logical expressions modelling using multiplexers.

- Observe the following truth table:

A	B	C	D	F(A,B,C,D)
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

- Obtain its canonical form and, by using the Boolean algebra properties, simplify it.
- Draw the logical diagram using only two input gates. Test the circuit using MULTISIM.
- How many integrated circuits should be used to implement this circuit as it is?
- If one replace all the gates by only NAND gates how many 74LS00 will be necessary?
- Use the multiplexer 8:1 to implement the above function.
- Using the integrated circuit 74LS151 implement the circuit of the previous question.



74LS151

Material:

- 1 x 74LS04
- 1 x 74LS08
- 1 x 74LS32
- 1 x 74LS86
- 1 x 74LS151
- 1 x Breadboard
- 1 x Power Supply