CS 2420 Lab 2

Topics: Logic Gates and Basic Chips

Pre Lab: Try and make equation in T5 only use NAND gates

Warning: DO NOT GIVE THE CHIPS A VOLTAGE HIGHER THAN +5V

T1. Generate Digital Signals in NI Elvis

Find the channels labeled DIO 0 and DIO 1. Put a wire from the DIO 0 channel to the channel labeled DIO 8 and a wire from the DIO 1 channel to the channel labeled DIO 9. Now click on the Digital Writer (DigOut) cell on the NI Elvis software bar. Make sure the manual pattern is "off, off" for DIO 0 and DIO 1 respectively. Now click on the Digital Reader (DigIn) on the Ni Elvis software bar.

Click on the green Write button. This puts a stable (continuous) 0v, 0v on the two channels labeled DIO 0 and DIO 1 respectively. Use the Digital Writer to change the values of DIO 0 and DIO 1as indicated below and record DIO 8 and DIO 9 outputs corresponding to the hi/lo manual patterns. Use the green Write button to make sure the voltages are updated on the DIO channels.

Input		Output (lo/hi)	
Manual DIO 1	Manual DIO 0	Dio 9	Dio 8
lo	lo		
lo	hi		
hi	lo		
hi	hi		

T2. Understand the function of a 7432 chip.

The 74 series chips provide all kinds of logic gates for general purpose. Many basic logic circuits covered in this semester can be found in this chip family. Usually, each chip has a few same logic fates. Your instructor will explain more about them.

We will study several QUAD 2-input 74xx chips in our experiments. All these chips have 4 logic gates and the same pin layout shown in Fig. 1 to the right.

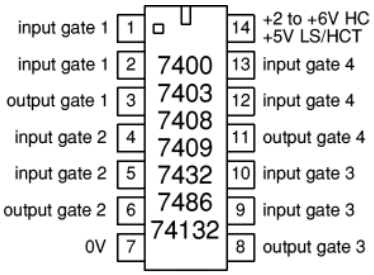

Figure 1

Find the 7432 chip already located on the board. Connect pin 7 to the "Ground" channel on the bottom left of the board and pin 14 to the "+5v" channel. Connect the two input pins (1 and 2) to the DIO 0 and DIO 1 channels and the output pin (pin 3) to DIO 8 channel. Use your Digital Reader (DigIn) to fill in the "truth table" below and your DIO 8 "reader" to verify the chip provides a common gate. Fill in the second table using Positive logic where x = DIO 1, y = DIO 0 and out = DIO 8.
The 7432 chip is a **QUAD 2-input _____ gate chip.**

Manual DIO 1	Manual DIO 0	DIO 8 (lo/hi)
lo	lo	
lo	hi	
hi	lo	
hi	hi	

X	Y	Out (0/1)
0	0	
0	1	
1	0	
1	1	

T3. Understand the function of a 7408 chip.

Repeat T2, except using the 7408 chip. The 7408 chip is a **QUAD 2-Input_____gate chip.**

Manual DIO 1	Manual DIO 0	DIO 8 (lo/hi)
lo	lo	
lo	hi	
hi	lo	
hi	hi	

X	Y	Out (0/1)
0	0	
0	1	
1	0	
1	1	

T4. Understand the function of a 7400 chip

Repeat T2, except using the 7400 chip. The 7400 chip is a **QUAD 2-input_____gate chip.**

Manual DIO 1	Manual DIO 0	DIO 8 (lo/hi)
lo	lo	
lo	hi	
hi	lo	
hi	hi	

X	Y	Out (0/1)
0	0	
0	1	
1	0	
1	1	

T5. Use a 74xx chip to implement a logic function

Now use the information you've learned above to create a circuit that is equivalent to the function below. Recall from class that any expression can be implemented with NAND gates. Verify this by implementing the expression xy' + z in one NAND chip and filling in the truth table below to check against your circuit. Draw a logic diagram with each gate labeled with its chip number and which pins are being used for input/output to/from the gates. If unclear of drawing ask instructor. Demonstrate the working circuit to your instructor and they will then sign off on your drawing if it produces the right outputs.

Hint: According to DeMorgan's law: A'' = A, (x+y)' = x'y', (x+y)'' = (x'y')' = x+y

x	y	z	Output
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	