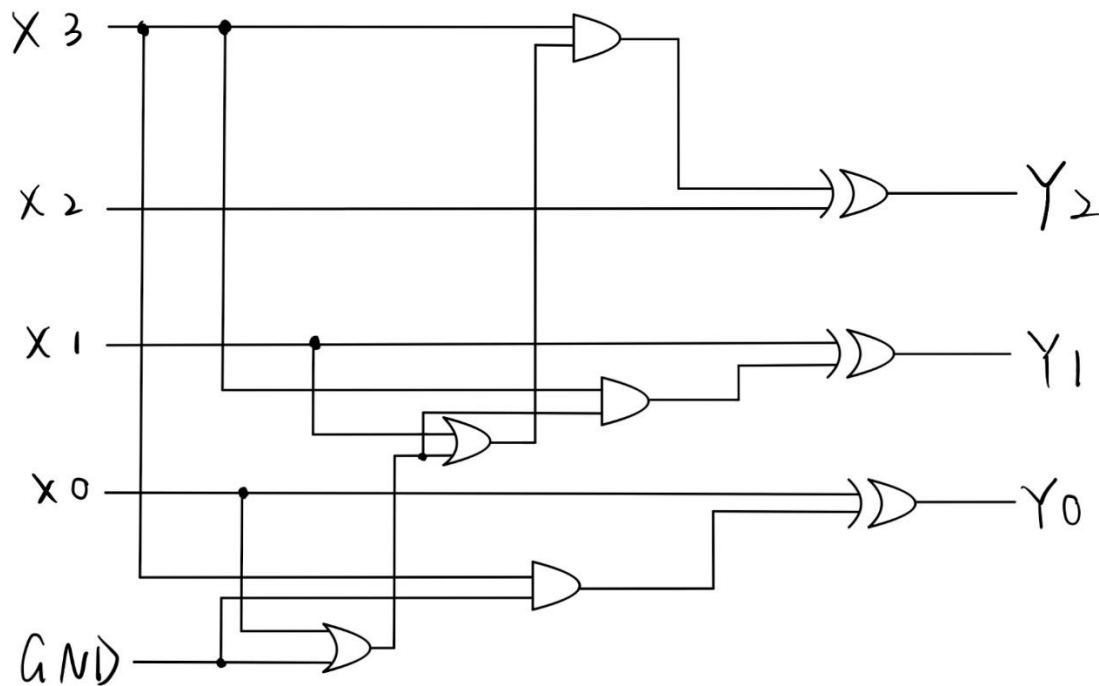


- 1) Y3 doesn't need output because no matter what the number is, the final output is positive and Y3 is 0. However, the input of Y3 is useful because we need it to determine the number is positive or negative.
- 2) In the 2's complement system, 1000 means -8, but there is no number can represent +8 in 4 bits 2's complement system. If we reverse the numbers and +1, the number is still 1000. Thus, make the assumption is reasonable. If this input happens, the system will output nothing, similar with 0000.

schematic of the circuit design:



Describe:

In the circuit, I use AND gates, which connect with X3, XOR gates, and OR gates to accomplish checking if X3 is 1 and then +1. If X3 is 0, all the AND gates will not work, then will output the same things by XOR gate. If the X3 is 1, Y0 still shouldn't change (because of +1), but Y1 and Y2 will change according to different input. So the ground line and the AND gate will always give 0 to the XOR, so the Y0 will be the same with X0. The input of the X0 will be checked by the OR gate and then send to the second AND. If the X3 is also 1, the second AND will send 1 to the second XOR, then change the result of the Y1. Similar logic in changing Y2.

OneDrive URL:

https://pennstateoffice365-my.sharepoint.com/:v:/g/personal/zjh5265_psu_edu/ES4IzGai2aNDmOm66ACr8V4B2unLURe-eTES-yasnpiz8A?e=GbsiHc

Forgot to say the above one is AND gate, the middle one is OR gate, the bottom one is XOR gate.