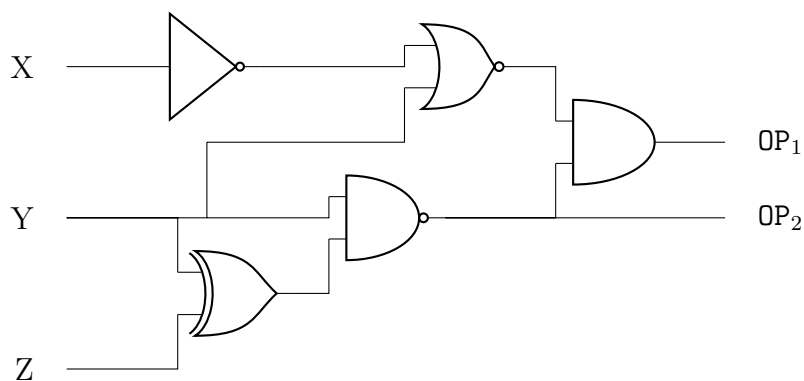


CS 31 Homework 2: Circuits  
Due Thursday, Sept. 25 by 11:59pm

Your names (include **all members of your group**):

1. Fill in the truth table for the following circuit. Note that this circuit is using NOT, XOR, NOR, and AND gates.

| x | y | z | $OP_1(x, y, z)$ | $OP_2(x, y, z)$ |
|---|---|---|-----------------|-----------------|
| 0 | 0 | 0 |                 |                 |
| 0 | 0 | 1 |                 |                 |
| 0 | 1 | 0 |                 |                 |
| 0 | 1 | 1 |                 |                 |
| 1 | 0 | 0 |                 |                 |
| 1 | 0 | 1 |                 |                 |
| 1 | 1 | 0 |                 |                 |
| 1 | 1 | 1 |                 |                 |



2. Construct a circuit that implements the following truth table. You may use any of the following one- or two-input gates: NOT, AND, OR, XOR, NAND, NOR, XNOR.

Write out the boolean expression for  $OP_1$  and  $OP_2$  before attempting to draw the circuit.

HINT: For  $OP_1$ , can you describe each case when the output is 1? How would you combine all the cases into a single circuit? Repeat this for  $OP_2$ .

| x | y | z | $OP_1(x, y, z)$ | $OP_2(x, y, z)$ |
|---|---|---|-----------------|-----------------|
| 0 | 0 | 0 | 0               | 0               |
| 0 | 0 | 1 | 1               | 1               |
| 0 | 1 | 0 | 1               | 0               |
| 0 | 1 | 1 | 1               | 0               |
| 1 | 0 | 0 | 0               | 0               |
| 1 | 0 | 1 | 0               | 1               |
| 1 | 1 | 0 | 0               | 0               |
| 1 | 1 | 1 | 1               | 1               |