HARDWARE EXERCISE 2: COMBINATIONAL LOGIC DESIGN USING 74xx ICs

Objective:
Using three switches, A, B and C, sound a warning buzzer (implemented by your 555 timer circuit) when the following conditions apply:

a. Switches A, B, C are all on.
b. Switches A and B are on but switch C is off.
c. Switches A and C are on but switch B is off.
d. Switches C and B are on but switch A is off.

Required Hardware:
- Your breadboard with the 555 timer circuit intact and able to generate a warning tone.
- 1 (one) Arduino board to use as a 5V power source.
- 1 (one) USB cable to power the Arduino board.
- 1 (one) 7400 quad 2-input NAND DIP
- 1 (one) 7410 triple 3-input NAND DIP
- 1 (one) DIP switch
- 3 (three) 1k Ohm resistors
- Wire as needed

Pre-Laboratory:
You must perform the following tasks prior to the start of class on Friday:
- Analyze the problem and use Logisim to design the minimum NAND gate (use only NAND gates) circuit satisfying the requirements.
- Draw the necessary connections on the mock-breadboard on the following page. In other words, wire the components on paper breadboard using a pencil.
  - The output of the NAND gate circuit should connect to the reset pin of the 555 timer assembly. In this way, the timer circuit will become active when the NAND circuit’s output is high.
  - Be sure to take the switch output from the boxed in area indicated on the mock-breadboard.

Grading:
To receive full credit (15 points) for this exercise you must:
1. Turn in the circuit you created in Logisim.
2. Turn in your mock-breadboard with pencil wiring.
3. Demonstrate the functionality of your completed breadboard circuit.
DIP switch

Switch outputs: Use 1st three switches only

2-Input NAND gates

3-Input NAND gates

Reset Pin

555 Timer Assembly

ABC