

ECE 476/676 - Homework #3

Binary Inputs, Serial I/O

Binary Inputs

Assume a thermistor with a temperature - resistance relationship of

$$R = 2000 \cdot \exp\left(\frac{3905}{T+273} - \frac{3905}{298}\right) \Omega$$

1) Design a circuit which outputs

- 0V for $T < 20^\circ\text{C}$
- 3.3V for $T > 20^\circ\text{C}$

2) Using the same thermistor, design a circuit with hysteresis: the output is

- 0V for $T < 15^\circ\text{C}$
- 3.3V for $T > 20^\circ\text{C}$
- No change for $15^\circ\text{C} < T < 20^\circ\text{C}$

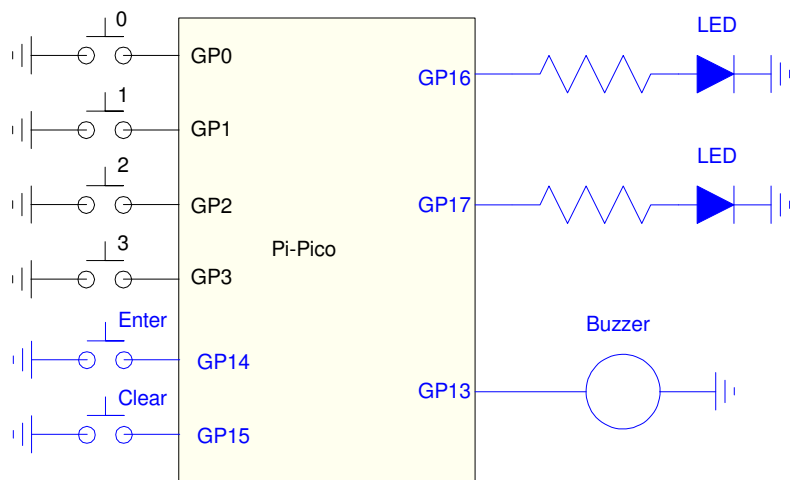
Serial Inputs & Combination Lock

3) (Hardware) Add four binary inputs to your Pico board connected to GP0 to GP3

- You can also use other GPIO pins if you want
- The pins shown in blue are already connected on your Pico board (no additional connection needed)

Include a photo of your breadboard and Pico board for full credit.

Other pins also work



Hardware: Add four more binary inputs

4-10) (Software) Write a python program which lets you input a number from 0000 to 3333 using the four push buttons.

- The number starts at 0
- Pressing a button adds that digit to the number (if the input is 12 and you press #3, the number registered becomes 123)
- Pressing GP15 clears the number
- Pressing GP14 enters that number as your combination.

If the combination is correct, light GP16 turns on for one second

If the combination is incorrect, light GP15 turns on for one second

If you guess incorrectly three times in a row, the buzzer turns on for one second.

Grading:

- 10pt You are able to input the number 0000 to 3333
- 10pt Pressing GP15 clears the number
- 10pt Pressing GP14 enters that number as your guess
- 10pt Light GP16 turns on if your guess is correct (your pick what the correct combination is)
- 10pt Light GP15 turns on for 1 second if your guess is incorrect
- 10pt Buzzer turns on for 1 second if you guess wrong three times in a row
- 10pt Demo. Demonstrate your combination lock (in-person or with a short video)