**OREGON INSTITUTE OF TECHNOLOGY**

**Computer Systems Engineering Technology Department**

***CST 315 – Embedded Sensor Interfacing I/O***

**Project Portion of Final Exam (50% of Final Exam Grade)**

**Requirements Document for Acceptance Test**

Systems will be demonstrated to the instructor by the designer/builder. Wilsonville students will provide a short video demonstrating the operation of their systems. Klamath Falls students will demonstrate their systems to the instructor in person.

1. Starting Conditions:

Bucket A is filled to 4 inches of water.

Bucket B is filled to 2 inches of water.

Use a ruler to show that the water levels meet the specifications. Record water levels below.

Water Level Bucket A: \_\_\_4\_\_\_\_\_\_\_ Water Level Bucket B:\_\_\_\_\_2\_\_\_\_\_\_\_

Send start signal to microcontroller to begin test.

1. First, pump water from Bucket A to Bucket B under microcontroller supervision. Stop pumping water from Bucket A to Bucket B when the water level in Bucket B reaches 4 inches. Pump motor must remain off for at least 10 seconds before water level is recorded. Record actual water level in Bucket B. \_\_\_\_\_\_\_\_\_3\_\_\_\_\_\_\_\_\_\_
2. Remove water from Bucket B with a plastic cup until the water level drops enough for the pump to start pumping. Stop removing water from Bucket B and wait for the pump to stop. Measure and record the water level in Bucket B after the pump has been off for at least 10 seconds.

Record water level in Bucket B.\_\_\_\_\_\_\_\_\_3\_\_\_\_\_\_\_\_\_\_\_

1. This is the end of the acceptance test.

**Additional information**

Grading will be as follows:

1. Requirement #2 – Water Level Bucket B should equal 4 inches.
   * 100 points for water level 4 inches +/- (1/16) of an inch
   * 85 points for water level 4 inches +/- (1/8) of an inch
   * 75 points for water level 4 inches +/- (1/4) inch
   * 65 points for water level 4 inches +/- (1/2) inch
   * 50 points for water level more than +/- (1/2) inch from 4 inches
2. Requirement #3 – Water Level Bucket B should equal 2 inches.
   * 100 points for water level 2 inches +/- (1/16) of an inch
   * 85 points for water level 2 inches +/- (1/8) of an inch
   * 75 points for water level 2 inches +/- (1/4) inch
   * 65 points for water level 2 inches +/- (1/2) inch
   * 50 points for water level more than +/- (1/2) inch from 2 inches
3. How was the current out of the microcontroller’s GPIO pin (connected to either a transistor or MOSFET) limited to 20 mA or less. Be quantitative. (100 points)

**We used a 330-ohm resistor to limit the current.**

**I = V/R => 3.3/330 = 10mA**

1. How was the signal from the oscillator’s output limited in order not to damage the input pin of the microcontroller. (100 points)

**Since the oscillator is only receiving the 3.3V from the PICO to begin with the output is limited to that voltage which is safe for the PICO.**

1. Provide a sketch of your circuit (electronic format or photo of sketch on paper) and explain how the circuit worked. (100 points)

**The circuit works by reading from the value from the capacitor and sending that through the oscillator to get a high or low from it. That high or low is then sent into the PICO and registered to help us determine the frequency. When the frequency is within a certain range, we will turn the motor on through the transistor and MOSFET via the PICO output pin GP14. This will activate the motor and start pumping until the frequency reaches the cutoff point and the bucket has enough water in it.**

Diagram

Description automatically generated