



# **CMPE1250 – Practical Assessment #1**

## **Embedded Systems Fundamentals**

### **Computer Engineering Technology**

Date: February 2023 (1222)

Time allowed: 1 Hour, 50 Minutes

Materials Permitted: Unlimited Code, Electronic Files, Paper

Student Name \_\_\_\_\_

The following policy is an addition to the Exam and Coursework Regulations and Procedures as outlined in the NAIT Electronics/Computer Engineering handbook. *It is the student's responsibility to be aware of the information contained in the handbook in addition to the following policy.*

#### **Use of Electronic Devices during Exams**

Use of electronic devices other than the approved calculator as outlined in the NAIT Electronics/Computer Engineering Student Guide or necessary medical devices will not be permitted during exams. The use of a calculator will be permitted only in exams where such use is considered appropriate to the content of the exam. For the purpose of this policy, exams are defined as any measurement tool used to determine learning taking place in classrooms, labs or in the field. These include but are not limited to lab exams, quizzes, midterm exams, final exams, etc.

*Definition of electronic devices: Including but not limited to tablets, MP3 players, pagers, cell phones, smart watches, radios, electronic daytimers, and laptop computers.*

The exam invigilator will ensure proper implementation of this policy and any decisions made will be final. Any challenges to a decision will need to be addressed in writing to the Assistant Program Head of the appropriate program.

Maximum Mark: 100

***You will create a project from the template repository for this exam. You will push the project and libraries, if applicable, at the conclusion of the exam. However, you can make partial commits for convenience.***

## **Preparation [10]**

Follow the procedure discussed in class by your instructor to create a project. Include initialization and support for your switches and indicator LEDs. You do not need to use the PLL library (but you can if you have it).

## **Part A [30]**

Create suitable code to pulse the **RED LED**. It will be **ON** for **10[ms]** and **OFF** for **15[ms]**. You may use whatever programmatic method you like to cause the necessary delays. Since the LED is toggling a full cycle every 25ms, it will appear as 40[Hz] on your AD2/scope. Marks may be reduced for low accuracy in your timing.

Use your AD2 or oscilloscope to capture the waveform on the associated red LED pin and save it as PARTA\_RTOG.PNG (you may use the Windows snipping tool for this).

You will submit this image with your code submission.

## **Part B [40]**

Add suitable code such that when **any two** (and ONLY two) of the switches are currently pushed, the **GREEN LED is on**. It should turn back **OFF** when **different than 2 presses** or **no press** is detected.

Demonstrate your functional solution, with all possible switch combinations, to your instructor. Part B code additions should not significantly impact the part A code.

## **Part C [20]**

Add a feature to **part B** to change the **RED LED ON** time to **15[ms]** and **OFF** to **10[ms]** when the two switches are detected as pushed. It should revert to normal, **as described in A**, when **different than 2 presses** or **no press** is detected.

## **Rubric**

### **Preparation (10 Marks)**

(10) Marks will be awarded if a complete project is created according to standards and procedures covered in class. The completed project must compile with no errors.

### **Part A (30 Marks):**

(20) Code is correct, complete, and well documented. Delays are acceptably accurate (**within 0.5% of ideal**).

(10) Capture of waveform with AD2 is complete. Frequency is obvious from capture. The waveform is complete and clear (full period). Suitable options are active, unnecessary options are inactive. Values and ranges are appropriate for the signal captured.

### **Part B (40 Marks):**

Solution operates as specified. Code is efficient in implementation and is well documented.

Demonstration is clear, and all test cases conclusively demonstrate the desired functionality.

### **Part C (20 Marks):**

Solution operates as specified. Code is efficient in implementation and is well documented.

**Ensure the project is committed and pushed to the repository as well as your libraries, if used.**