

## **VANIER COLLEGE – Computer Engineering Technology – Autumn 2017**

Introduction to Microprocessors (247-302)

# **Lab 5**

## ***TMR0 as Counter***

**NOTE:**

To be completed in ONE lab sessions of 3 hrs.

One report has to be submitted **not later than one week** after the last lab session.

This exercise is to be done **individually** except where specified in the procedure. **Each** student must submit a lab report with original design, observations and conclusions.

## **OBJECTIVES:**

After completing this lab, the student will be able to:

1. Familiarize with configuration of Timer0 in PIC microcontroller
2. Use Timer0 as counter
3. Design and implement a simple counter firmware

## **THEORY:**

Refer to theory notes of week 9 related to timers of PIC16f887.

## **Lab procedures**

**Note:** *This lab is based on your PIC16F887 prototype board built previous labs. Make sure your circuit is correctly designed and connected before you proceed with this lab.*

In this lab, TMR0 will be used as a counter. The idea is to connect the counter input to one pushbutton so that it counts one pulse at a time upon every button press. The 4 LEDs will then be used to show the counter value in binary code.

1. Start a new project in MPLABX and name the project *Lab5*.
2. Modify your code and your circuit to achieve the design requirements. This includes:
  - a) Design and connect a simple push button circuit to the specific pin for counter operation of TMR0.
  - b) Configure TMR0 as counter in your code. Ensure all necessary configuration bits are set accordingly in OPTION\_REG.
  - c) Modify your code to display the counting of button pressed as binary code on LEDs.
3. Compile and download your code to your circuit. Verify your code operation on the circuit. Show your working set to your instructor.
  - a) Does the counter (as indicated by the 4 LEDs) always operate as expected? If no, why?
  - b) If your answer is no in part (a), what could be the possible solution(s) to resolve the problem?
4. Include a copy of all your source codes (all the parts), full detailed schematic, and answer all the question in your report. Also includes any observation, analysis if any.