# ECE 376 - Test #3: Name \_\_\_\_\_

Fall 2022. Open-Book, Open Note

1) Single Interrupt: Write a program for a back-up alarm using TImer2 interrupts.

a) Set up Timer2 to output a 716Hz square wave on RC0

N f = 716Hz	А	В	С

<ul> <li>Write the main routine and interrupt servive routine which</li> <li>Plays 716 Hz on RC0</li> <li>For 50 toggles (25 cycles)</li> <li>Waits (pauses) for 1 second,</li> <li>Then repeats</li> </ul>	RC0	716Hz 50 toggles 25 cvcles	1 second Wait_ms(1000);	716Hz 50 toggles 25 cvcles	
Main Routine - main loop Play 716 Hz for 25 cycles every second Assume Timer2 has been initialized for 716Hz			Timer2 Interrup Play 716Hz for 25 cycle	ot Routine es every second	
<pre>while(1) {</pre>		void Intern if(TMR2IF)	<pre>rupt(void) { { </pre>		

## 2) Multiple Interrupts: Write a C program for a back-up alarm

Timer0 controls the output on RC0:

• RC0 is set for 250ms then cleared for 750ms, then repeats

Timer1 controls the output on RC1:

• RC1 outputs 716Hz whenever RC0 = 1



#### a) Specify the pre-scalar used for Timer0 and Timer1

Timer0 Pre-Scalar	Timer1 Pre-Scalar

### Interrupt Service Routines

Timer0 Set RC0 for 250ms then Clear RC0 for 750ms & repeat	Timer1 Toggle RC1 at 716Hz whenever RC0 = 1
if(TMROIF) {	if(TMR1IF) {

## 3) Timer1 Compare: Backup Alarm

Write the interrupt service routine for a back-up alarm.

- RC2 outputs a 250ms pulse every 1000ms (controlled by Timer1 Compare1 inerrupts)
- RC1 outputs a 716Hz square wave when RC2 = 1 (controlled by Timer1 Compare2 interrupts)



<b>Timer1</b>	Compare1 (RC2)	Compare 2 (RC1)
pre-scalar (1 / 2 / 4 / 8)	Set RC2 / Clear RC2 / No Change	Set RC1 / Clear RC1 / No Change

// Global Variables (if needed)

// Interrupts

Timer1	Compare 1 Output a 250ms pulse every 1000ms	Compare 2 Output 716Hz when RC2 = 1
if(TMR1IF) {	if(CCPR1IF) {	if (CCPR2IF) {



4) Filter Analysis: Assume X and Y are related by the following transfer function

$$Y = \left(\frac{0.02(z+1)}{(z-0.9)(z-0.7)}\right) X = \left(\frac{0.02z+0.02}{z^2-1.6z+0.63}\right) X$$

a) What is the difference equation that relates X and Y?

b) Find y(t) assuming

 $x(t) = 6 + 2\cos(250t) + 5\sin(250t)$ 

Assume a sampling rate of T us where

•  $T = 800 + 100^{*}$ (your birth month) + (your birth date) micro-seconds

T =

y(t) =

Bonus! Implement and demonstrate one of the programming problems using interrupts (back-up alarm)