ECE 376 - Test #3: Name _____

Spring 2023

1a) Single Interrupt. The following C code sets up a Timer2 interrupt to output a square wave on RC0. Determine the frequency that appears on pin RC0.

b..e) If the following sections of code are deleted, what frequency will you see on pin RC0?

Section of Code	Frequency on RC0 if this section is deleted

`// Global variable`
`unsigned int COUNT`
 	
`void interrupt IntServe(void) {`
	code doesn't compile

`RC0 = !RC0;`	b)
`TMR2IF = 0;`	c)

`}`
`void main(void) {`
`  TRISC = 0;`
`  ADCON1 = 0x0F;`
	code doesn't compile

`  T2CON = 163;` `  PR2  = 163;`	d)

`  TMR2ON = 1;`
`  TMR2IE = 1;`
`  TMR2IP = 1;`
`  PEIE = 1;`
`  GIE = 1;`
	e)

`  while(1) {`
`  RC1 = !RC1;`
`  }`
`  }`
	code doesn't compile

2) Multiple Interrupts: Give the interrupt service routine and interrupt initialization code so that the PIC outputs a

- M Hz square wave on RC0 using Timer0 interrupts (M = your birth month, 1..12)
- D Hz square wave on RC1 using Timer1 interrupts (D = your birth date, 1..31), and
- X Hz square wave on RC2 using Timer3 interrupts (X = 800 + 100*M + D. May 14th gives 1314Hz)

Interrupt Initialization

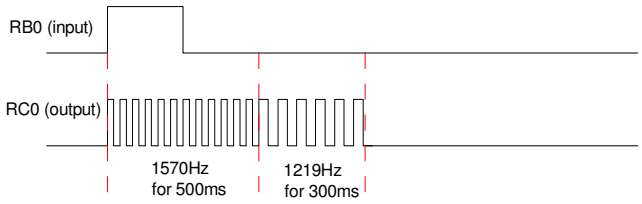
	Timer0 M Hz square wave on RC0	Timer1 D Hz square wave on RC1	Timer3 XHz square wave on RC2
frequency (Hz)			
# Clocks between interrupts			
PS			

Interrupt Service Routines

Timer0 M Hz square wave on RC0	Timer1 D Hz square wave on RC1	Timer3 XHz on RC2
`if(TMR0IF) {`	`if (TMR1IF) {`	`if (TMR3IF) {`

3) Electronic Chickadee: Write a C program which uses interrupts to play the song of a chickadee (type of bird) when you press RB0:

- When RB0 is pressed (INT0 interrupt)
- RC0 plays 1570Hz for 500ms, the
- RC0 plays 1219Hz for 300ms



Let

- INT0 detect the button press
- Timer0 set the duration of the note (500ms then 300ms)
- Timer1 sets the frequency of the note (1570Hz then 1219Hz)

a) Interrupt Initialization: (affects the interrupt service routine)

INT0 rising or falling edge	PS0 prescalar for Timer0 (1,2,4,8,...,256)	PS1 prescalar for Timer1 (1,2,4,8)

b) Interrupt service Routines

INT0 trigger on RB0	Timer0 500ms or 300ms note	Timer1 1570Hz or 1219Hz
`if(INT0IF) {`	`if(TMR0IF) {`	`if(TMR1IF) {`

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

$$Y = \left(\frac{2(z-0.9)}{(z-0.8)(z-0.5)}\right)X = \left(\frac{2z-1.8}{z^2-1.3z+0.40}\right)X$$

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) =