YOUR NAME
EE 310
LAB 5
3/21/2017
Instructor Name

TITLE: GENERATING 5kHz WAVEFORM, FSK MODULATION, AND

BINARY COUNTER

_____

<mark>List of Content: (Just Update Entire Table)</mark>

<mark>IF YOU USE GOOGLE MAKE SURE THE FORMAT IS NOT CHANGED!</mark>

Pre-Lab:

1. Using the data sheet for <u>PIC18F45K20</u> microcontroller, answer the following questions:
    i. What type of packaging the chip on the DEMO board has?
        1. 44-Lead TQFP
    ii. How many pins does the chip on the DEMO board have?
        1. 44
    iii. What is the size of the SRAM on the chip?
        1. 1536 Bytes
    iv. How may IO ports does the chip have?
        1. 36
    v. Which pin is connected to RC3 of the chip on your DEMO board?
        1. 37
    vi. How many FSR registers does this chip have?
        1. 3
2. Learn about the <u>PICKIT3 DEMO</u> board. Carefully review the <u>layout</u> of the board. Also review the board's <u>schematic</u>. Answer the following questions:
    i. How many LED's are on the DEMO board?
        1. 8
    ii. Which pins on the chip are connected to the LEDs?
        1. 38,39,40,41,2,3,4,5
    iii. Which pin is connected to the potentiometer on the board?
        1. 19
    iv. What is the reference designator of the 32KHz oscillator on the board? Is it soldered on the board?
        1. X2, it's surface mount
    v. Identify PWR and GRN pins on the board.
        1. PWR (7,28), GRN (6,29)
    vi. What happen if you remove the JP1 connector?
        1. The LED's are connected to the JP1, which in turn is grounded so if we remove it, the LED's won't be grounded.

IMPORTANT NOTES:
1. Absolutely no hand writing – all figures must be done by computer.
2. All questions must be added.
3. Name/class/date on all assignments must be there
4. The list of figures must be updated
5. Everything must be readable – otherwise you don't receive grade
6. Late demos result in -10 points, automatically.
7. It is your responsibility to show me your demos. Come during the office hours.
8. 10 point deduction for every day you are late. Any assignment not submitted during the class is considered to be late!
9. Snapshots must be from the computer. No photos by camera is acceptable.
10. Questions and answers must be clearly stated and shown in the submission.
11. All figures and tables must have <u>figure number</u> and <u>table number</u>

**IF THERE IS ANYTHING YOU ARE NOT SURE ASK!**

PART I

1- Problems Statement:
The purpose of this assignment is to design ….

2- Code Example:

```
;/*************************************************
;// TITLE:  5kHz WAVEFORM
;// *************************************************
;// PROGRAM DETAIL
;// *************************************************
;// PURPOSE: TO GENERATE A SQUARE WAVE OF 5 kHz FREQUENCY
;// BY TURNING ON AND OFF BIT0 OF PORTD IF THE CLOCK
;// FREQUENCY IS 1 MHz
;// INPUTS: COUNT
;// OUTPUTS: PORTD
;// DATE: 3/21/2017, 9 AM
;// COMPILER: MPLAB v3.51
;// AUTHOR: NATHANEAL MAGARDIE
;// VERSIONS: V1


;// *************************************************

;//** I N C L U D E S ****************************/
        list p=18f45k20, f = inhx32
        #include p18f45k20.inc

;//** C O N F I G U R A T I O N B I T S **********/
 CONFIG FOSC = INTIO67    ; INTIO67 Note that if it is HS it will not work!
 CONFIG LVP = OFF
 CONFIG PWRT = ON

 CONFIG FCMEN = OFF
 CONFIG IESO = OFF ;// CONFIG1H

 CONFIG BOREN = SBORDIS
 CONFIG BORV = 30 ;// CONFIG2L
 CONFIG WDTEN = OFF
 CONFIG WDTPS = 32768 ;// CONFIG2H
 CONFIG MCLRE = OFF
 CONFIG LPT1OSC = OFF
 CONFIG PBADEN = ON
 CONFIG CCP2MX = PORTC ;// CONFIG3H
```

```
;//** I N I T I A L I Z A T I O N ***********/
;//** Constants
count equ d'5'
;//** Register Declaration:
reg1 equ 0x01 ;define addresses of data reg
reg10 equ 0x10 ;ref for 50us delay count

;//** M A I N   C O D E  ***********/

        org 0x20

        ;//** I N I T I A L I Z A T I O N ***********/

        MOVLW  B'11111110'   ;# TO SET UP BIT0 AS AN OUTPUT
        MOVWF  TRISD         ;INITIALIZE BIT0 AS AN OUTPUT
        MOVWF  reg1          ;SAVE BIT PATTERN IN REG1
ONOFF   MOVFF  reg1,PORTD    ;TURN ON/OFF BIT0
        CALL   DELAY     ;CALL 100ms DELAY
        COMF   reg1,1        ;COMPLEMENT BIT PATTERN
        BRA    ONOFF         ;GO BACK TO CHANGE LED

        ORG 0x40             ;BEGIN SUBROUTINE AT 00040H
DELAY ; A DELAY OF 100 MICRO SECONDS
        MOVLW  count         ;load decimal count in W
        MOVWF  reg10         ;SET UP REG10 AS A COUNTER
LOOP    DECF   reg10,1       ;decrement reg10
        BNZ    LOOP          ;GO BACK TO LOOP IF REG10 DOES NOT=0
        RETURN
        END
```

Heading and first part of the code	The xxx MACRO to perform the delay

| **3- Flowchart**	
As shown in the flowchart the DelayCALL performs the delay function. Every time the bit is toggled the delay function is repeated! Some explanation.	
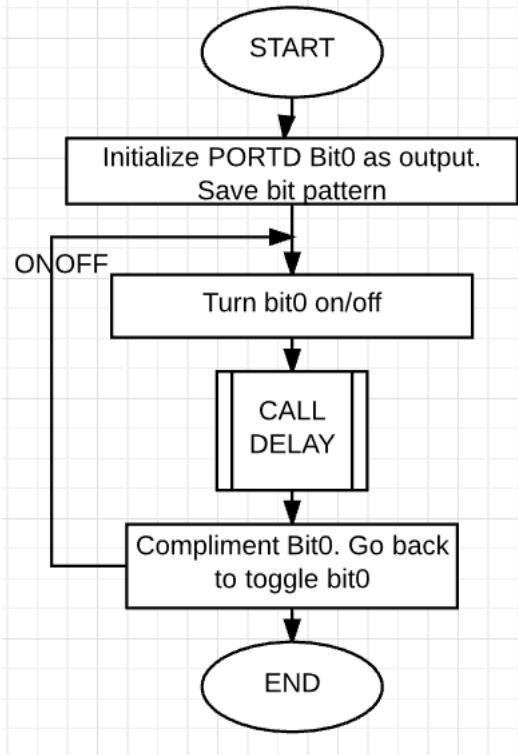
4- Results	
A- Scope snapshot: In this figure we show how the ourput signal from PIN xxx. Note that the frequency is about xxx. We used automeasurement. Using the cursors, the frequency was measure to be xxx, slightly different.	
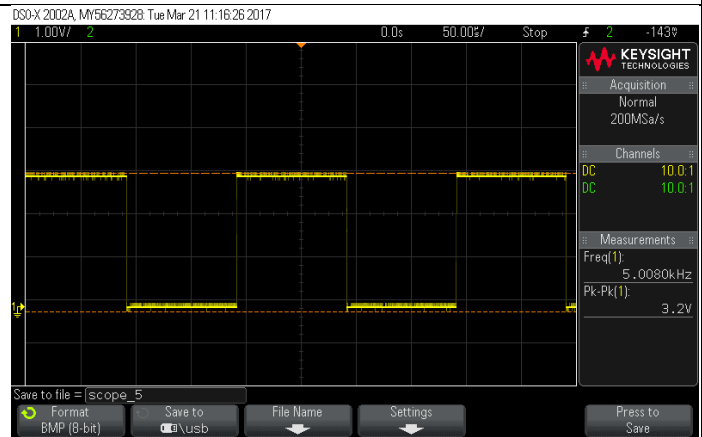
B- Another picture - This program used 0% of the flash memory. In total it only used 26bytes of data which is very small in comparison to the capacity it can maintain.
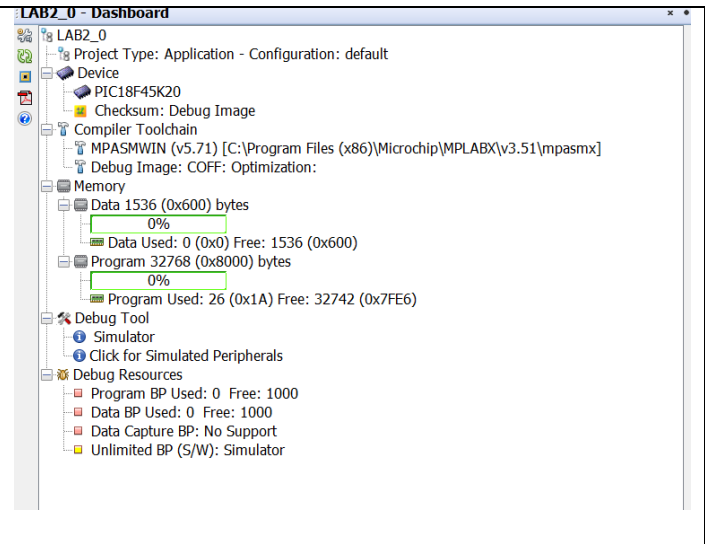
Name	Type		Address		Value	
<Enter new watch>						
☑ 0x20	(1) Bytes		0x20	...	0x00	...
☑ 0x20	(1) Bytes		0x20	...	0x00	...
☑ 0x20	(1) Bytes		0x20	...	0x00	...
☑ 0x21	(1) Bytes		0x21	...	0x00	...
☑ 0x220	(1) Bytes		0x220	...	0xFF	...
☑ 0x221	(1) Bytes		0x221	...	0x05	...
☑ 0x230	(1) Bytes		0x230	...	0x04	...
☑ 0x231	(1) Bytes		0x231	...	0x01	...
☑ 0x30	(1) Bytes		0x30	...	0x00	...
☑ 0x31	(1) Bytes		0x31	...	0x00	...
☑ 0x40	(1) Bytes		0x40	...	0x00	...
⊞ ☐ BSR	SFR		0xFE0	...		...
⊞ ☑ PORTC	SFR		0xF82	...	0x00	...

C – If you need more space leave the picture like this. Explain what this is. If the text is not readable do something about it!

5- Conclusion / Answering questions:

In this section you can answer to all the questions. Make sure you include the entire question.
For example: For the 5 kHz frequency, there was a continuous mono-tone pitch. The frequency was moving to fast to hear the high and low points.

PART II

1- Problems Statement:
The purpose of this assignment is to design ….

2- Code Example:

```
;/************************************************
;// TITLE:  5kHz WAVEFORM  MUST HAVE THIS SECTION!
;// ************************************************
;// PROGRAM DETAIL
;// ************************************************
;// PURPOSE: TO GENERATE A SQUARE WAVE OF 5 kHz FREQUENCY
;// BY TURNING ON AND OFF BIT0 OF PORTD IF THE CLOCK
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        BNZ   LOOP          ;GO BACK TO LOOP IF REG10 DOES NOT=0
        RETURN
        END
```
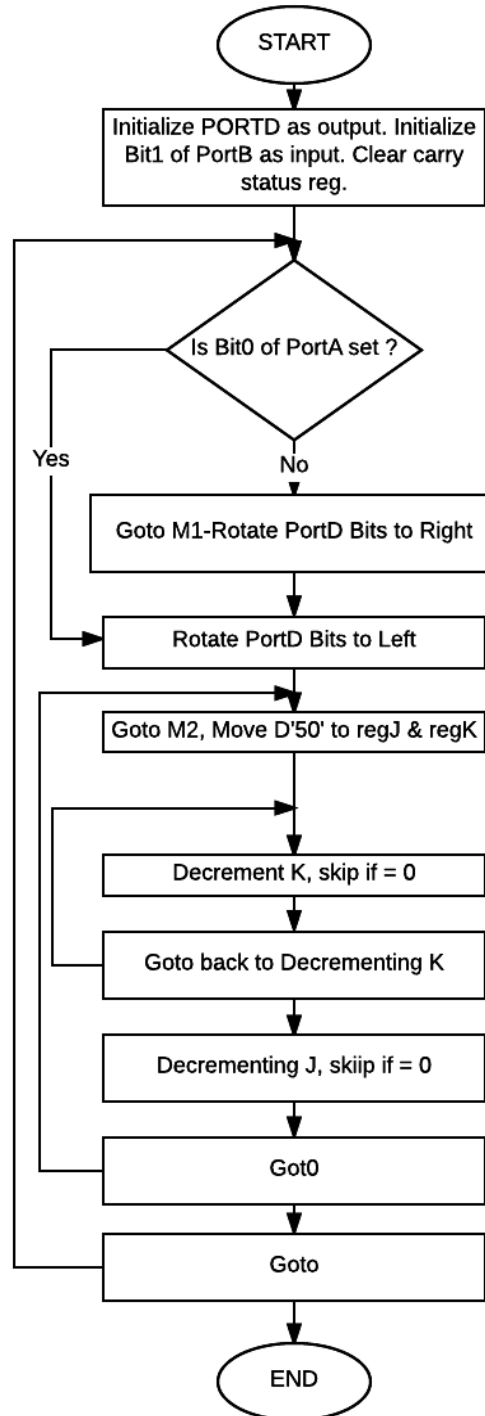
Heading and first part of the code	The xxx MACRO to perform the delay

## 3- Flowchart *must be all in one page!)

As shown in the flowchart the DelayCALL performs the delay function. Every time the bit is toggled the delay function is repeated! Some explanation.

Describe the flowchart more.

4- Results

A- Scope snapshot: In this figure we show how the ourput signal from PIN xxx. Note that the frequency is about xxx. We used automeasurement. Using the cursors, the frequency was measure to be xxx, slightly different.
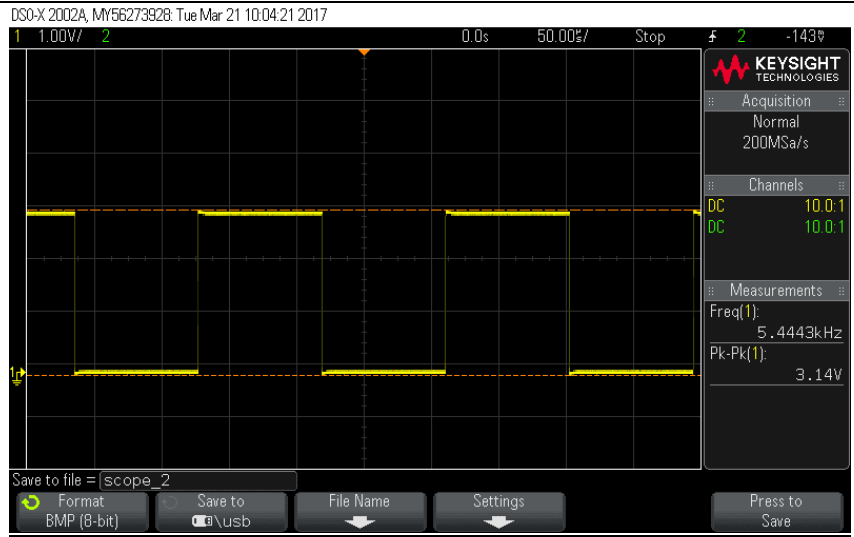
B- Note that in this figure we are showing the 5.2KHz signal. The cursors are located at … and the frequency is measured to be xxxx. The signal amplitude is xxxx
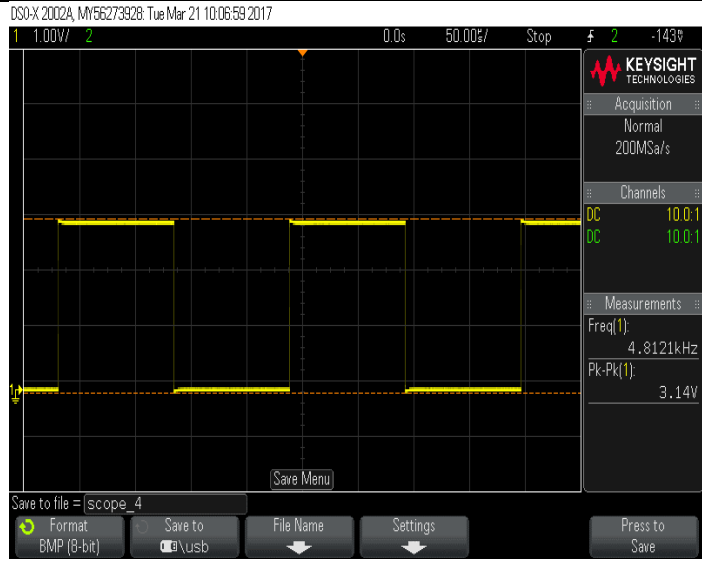
INPUT1	INPUT2	SUM	CARRY	Fcyc
0x220	0x221	0x230	0x230	Time
0xFF	0x05	0x04	0x01	50ms
0x05	0xFF	0x04	0x01	50ms
0xFF	0xEE	0xED	0x01	50ms
0xFF	0xA0	0x9F	0x01	50ms
0xA0	0xA0	0x40	0x01	50ms
0x00	0x00	0x00	0x00	50ms

C- Test Program: Chart of Values: This is a chart of the values that I tested in order to make sure my program is working correctly. So I changed the order of variables to make sure I got the same answer and tested my carry in order to make sure that my carry bit was carried into the proper register.

5- Conclusion / Answering questions:

In this section you can answer to all the questions. Make sure you include the entire question.
For example: For the two frequencies, 5.2 kHz and 4.8 kHz, one could hear a distinct change in tone or
….

<mark>WHEN YOU FINISHED DO THE FOLLOWING – REMOVE THIS SECTION</mark>

1- Make sure all your tables and diagrams are organized well / keep tables on the same page. Remove white spaces (-5 points)

2- Don't forget figure numbers/ table numbers (-5 points)

3- Update the list of Content on page 1 (-5 points)

4- Make sure you change your name on the footer (-5 points)

5- Make sure you chance the assignment number (LAB 2) on the footer (-5 points)

6- Go to: FILE → REDUCE FILE SIZE → 96 PPI

ABSOLUTELY DON'T