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MIE438 – Microprocessors and Embedded Microcontrollers

Laboratory Experiment 3

Deliverable

Spring 2018

Department of Mechanical and Industrial Engineering

University of Toronto

Notes:

Practical Section:

Last Name, First Name	Student Number
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1. Record your array reading program here:

MAIN:
```
LDX #tone
LDY #length
LDAB #0
```

LOOP:
```
LDAA B,X
STAA PORTB
LDAA B,Y
STAA PORTB
ADDB #1
CMPB #11
BNE LOOP
```

2. Record your code for the if/else statement here:

```
loop:

if: CMPA #0
BNE else

then: LDAA #$FF
STAA PORTB
BRA endif

else: LDAA #0
STAA PORTB

endif:

ADDB #1
CMPB#11
BNE loop
```

3. What frequency of square wave is created at the output? Is the duty cycle of the square wave 50% (i.e., is the amount of time spent 'off' equal to the amount spent 'on')? If not, why might this be the case (refer specifically to the code)?

The square wave has a frequency of: 1.97 kHz

THe duty cycle of the square wave is not 50%. This can be seen in the code as

4. Change the code from Question 3 to produce a symmetrical square wave (or as close to one as you can). Record your code changes here. Hint: Should be a short change.

5. Change the 'Inner Frequency Scaling' value from #14 to a different, yet still small, value (not zero). What effect does this have on the frequencies **and length** of each tone? Why does this happen?

Increasing 14 resulted in a decrease in frequency (observed by a decrease in pitch of the tone). Change in length could not be determined since a single tone was only played. This happens

*Note: File Lab3_3 was used for this question since a constant inner frequency scaling of 14 was only found in that file (asked TA)

6. Re-write the program (beginning at 'start:' and ending at 'endprog:' as high-level pseudo-code, high-level C-like code, or a flowchart (if you prefer). Try to capture the functionality more than the changes to individual registers, etc. It would be best to convert any loops or flow control elements to the appropriate high-level structures, such as FOR-loops, DO/WHILE, IF/ELSE, etc.

Fun (Easy): Identify the song. **(Hard):** Change it to any other 8-bit music (I recommend a Megaman boss theme). If you do, please take a video!

This lab hand-in is due at the start of the subsequent lab section.