ECEN 5613	Embedded System Design	Week #1
Spring 2019	Lab #1 Signoff Sheet – Part 1 Elements	1/14/2019

You will need to obtain the signature of your TA on the following items in order to receive credit.

The Part 1 Elements of Lab #1 should be completed and signed off by **Friday, Jan. 25, 2019** in order to give you time to complete the Part 2 Elements upon receipt of your parts kit. Both signoffs are due by **Friday, Feb. 8, 2019**. You need to submit both of your signoff sheets and other required elements by **11:59pm Saturday, Feb. 9, 2019**. Labs completed after the signature due date or submitted after the submission due date will usually receive grade reductions, but there is leniency on Lab #1.

Print your name below and then demonstrate your working hardware/firmware in order to obtain the necessary signatures. All items must be completed to get a signature, but partial credit is given for incomplete labs. Receiving a signature on this signoff sheet does not mean that your work is eligible for any particular grade; it merely indicates that you have completed the work at an acceptable level.

Student Name: RUSHI JAMES MACWAN

Checklist

- ☑ Student demonstrates detailed knowledge of a simulator (including changing register values, editing data memory, using breakpoints, single stepping, uses /overlay option, etc.)
- ☑ Student assembly program works correctly
- ☑ Student demonstrates detailed knowledge of WinCUPL and WinSim, logic equations correct

Student Answers to Lab Questions

1. **How many bytes of code space does your program require?**
   (Show how you arrived at your answer.)
   Code Size? 56 Bytes (The code begins in the memory space at 0x0000h and the last line of the code ends at 0x0037h which is 56 bytes of space in the memory)

2. **How long did your program take to execute for X=0x20 and Y=0x0A? Assume an 11.0592 MHz clock and include the instructions executed from the beginning until you reach the ENDLOOP label. Show the TA your detailed calculations on the code listing during your signoff.**
   Execution Time? 1.83858 µs x 2 (oscillator cycles/state) = 3.67716 µs.
   (For 8051, there are 6 states in one cycle and every second there are 11.0592M cycles. So, for 12 1/6 cycles, we need 1.83858 µs).

Please, disregard this calculation. Look on the backside.

Friday 2/14

TA signature and date

Instructor/TA Comments: ☐ ☐ ☐

FOR INSTRUCTOR USE ONLY	Not Applicable	Poor/Not Complete	Meets Requirements	Exceeds Requirements	Outstanding
SPLD code	☐	☐	☑	☐	☐
Assembly Language Code Style	☐	☐	☑	☐	☐
Required Elements functionality	☐	☐	☑	☐	☐
Sign-off done without excessive retries		☐	☐		
Student understanding and skills	☐	☐	☑	☐	☐
Overall Demo Quality	☐	☐	☑	☐	☐

Comments:

*Keil IDE/simulator used in 8051 asm portion
+ well-commented code

NOTE: This submission sheet should be the top/first sheet of your submission.

Calculation for Problem-2:-

→ For every 6 states, there are 12 oscillator cycles.

∴ For 122 states, we need the following oscillator cycles:-

$$= \frac{122 \times 12}{6} = 244 \text{ cycles.}$$

→ Now, every second there are 11.0592M cycles and so for 244 cycles to execute, we will need the following time:-

$$= \frac{244}{11.0592M} = 22.0630787 \text{ Msec.}$$

ECEN 5613 Spring 2019	**Embedded System Design** **Lab #1 Signoff Sheet – Part 2 Elements**	Week #1 1/14/2019

Print your name below, answer the questions, and then demonstrate your working hardware in order to obtain the necessary signatures. All items must be completed to get a signature.

Student Name: RUSHI JAMES MACWAN

Checklist

- ☑ Schematic of acceptable quality. Student name on board in permanent ink
- ☑ Pins and signals labeled, decoupling capacitors, and two 28-pin wire wrap sockets present on board
- ☑ Mounting hardware present (e.g. standoffs or an enclosure)
- ☑ Power switch and LED, voltage regulator functional, power jack present
- ☑ Power-on Reset (RC) and Run-time Reset (pushbutton), 8051 bypass cap is present
- ☑ RS-232 connector mounted, 74LS373 transparent latch wired
- ☑ Logic outputs correct (e.g. SPLD generation of /READ and /CSPERIPH: view SPLD code)
- ☑ Student displays good knowledge of oscilloscope
- ☑ Peak to peak noise measured across processor VCC and GND is < 800mV
- ☑ Oscillator functional (check for correct ALE/XTAL2 signals after power on-off cycles)
- ☑ ARM development board functional, student can demonstrate the basic software.

Student Answers to Lab Questions

1. **What voltage is present at the regulator input?** Use a digital multimeter. 7.48 V
2. **What voltage is present at the regulator output?** Use a digital multimeter. 5.00 V
3. **What peak to peak noise is present across the processor VCC and GND?** Use an oscilloscope.

   Measured value at processor package pins on top side of board: 40 mV (340mV)*

   Measured value at wire wrap socket pins on bottom side of board: 34 mV (250 mV)*

   * After programming SPLD.
4. **How long is the processor held in reset after the run-time reset pushbutton is released?** Use an oscilloscope and try to measure the time between the release of the pushbutton and the time when noise from ALE is observed on the RST signal.

   Measured value: 130.4 msec
5. **What frequency is present at the ALE pin?** Use an oscilloscope. 1.845 MHz

3/4

TA signature and date

Instructor/TA Comments: ☐ ☐ ☐

FOR INSTRUCTOR USE ONLY	Not Applicable	Poor/Not Complete	Meets Requirements	Exceeds Requirements	Outstanding
Schematics, SPLD code	☐	☐	☐	☑	☐
Hardware physical implementation	☐	☐	☑	☐	☐
Required Elements functionality	☐	☐	☑	☐	☐
Sign-off done without excessive retries		☑	☐		
Student understanding and skills	☐	☐	☑	☐	☐
Overall Demo Quality	☐	☐	☑	☐	☐

Comments:

3/2: All HW functional. Just needs schem & msp demo + screenshots look good

NOTE: This submission sheet should be the second sheet of your submission.

Submission Sheet 2

Submission Sheet

Instructions: Print your name below and sign the honor code pledge. Separate the signoff and submission sheets from the rest of the lab and turn in a scan (or clear picture) of these signed forms, the items in the checklist below, and the answers to any applicable lab questions in order to receive credit for your work. No cover sheet please. **Submit all items electronically via Desire2Learn to reduce paper usage. D2L is https://learn.colorado.edu.**

In addition to the items listed on the signoff checklist, be sure to review the lab for additional requirements for submission, including:

- ❑ Scan of signed and dated Part 1 signoff sheet as the top sheet (No cover sheet please)
- ❑ Scan of signed and dated Part 2 signoff sheet as the second sheet
- ❑ Scan of submission sheet with signed honor code pledge as the third sheet
- ❑ PDF of complete and accurate schematic of acceptable quality (all components shown).
- ❑ Fully, neatly, and clearly commented assembly code.

Make copies of your code, SPLD code, and schematic files and save them as an archive.

Student Name: RUSHI JAMES MACWAN

Honor Code Pledge: "On my honor, as a University of Colorado student, I have neither given nor received unauthorized assistance on this work. I have clearly acknowledged work that is not my own."

Student Signature: Rushi J. Macwan

1. **How much power is dissipated in the regulator, assuming a load current of 300mA?** Assume that the regulator is drawing the max quiescent current shown in the data sheet (use the correct data sheet for the regulator you have on your board). Neatly show all your work.

Total power dissipated = 0.767936 Watts

Calculation:-

1) Power dissipated due to Quiescent current:-
$P_1 = V \cdot I = (7.48\,V) \times (3.2\,mA) = 23.936\,mWatts$

2) Power dissipated in stepping down the voltage using the load current:-
$P_2 = (7.48 - 5.00) \times (300\,mA) = 744\,mWatts$

$\therefore P_{total} = P_1 + P_2$

Calculated value: $P_{total} = 0.767936\,Watts$

Comments:

I used the MC7805ACTG voltage regulator and the "typical" quiescent current value is 3.2 mA which I used for calculating P_1 above.

NOTE: This submission sheet should be the third sheet of your submission.