

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

The Part 1 & Part 2 Elements of Lab #1 should be completed and signed off by **Friday, Sept. 15, 2023** in order to give you time to complete the Part 3 Elements upon receipt of your parts kit. All signoffs are due by **Friday, Sept. 22, 2023**. You need to submit both of your signoff sheets and other required elements by **11:59pm Sunday, Sept. 24, 2023**. 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: Jithendra HS

### Checklist

- ☒ Student demonstrates detailed knowledge of an 8051 simulator or debugger (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 demonstrates detailed knowledge of the final project assignment and discusses any questions with the TAs.

### 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? 75 Bytes

$$\begin{aligned} \text{END Addr} &= 04B \\ &= 16 \times 4 = 64 \\ B &= 11 \\ \hline &75 \text{ Bytes} \end{aligned}$$

2. How long did your program take to execute for X=0x93 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? 78Hs (from Edsim 51 tool).

Reshade  
09/15/23

Instructor/TA Comments:

☐ ☐ ☐

TA signature and date

### FOR INSTRUCTOR USE ONLY

|   | Not Applicable           | Poor/Not Complete        | Meets Requirements                  | Exceeds Requirements     | Outstanding              |
|---|--------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|
| SPLD code                               | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Assembly Language Code Style            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Required Elements functionality         | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sign-off done without excessive retries | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Student understanding and skills        | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overall Demo Quality                    | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

### Comments:

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

(+) good knowledge of simulator.

(+) good knowledge of WinSim + WinCpl

(-) ESE coding guidelines can be ~~impr~~ followed.

(+) good schematic.

$$f = 11.0592 \text{ MHz}$$

$$T = \frac{1}{f} = \frac{1}{11.0592 \times 10^6} = 90 \text{ ns (1 clock cycle requires 90 ns)}$$

$$1 \text{ Machine cycle} = 12 \text{ clock cycles.}$$

$$\text{Execution time} = \text{no of clock cycles} \times \text{Value of 1 clock cycle in terms of Time.}$$

| Op code | Machine cycles | repetition in code | Total cycles |
|---------|----------------|--------------------|--------------|
| MOV     | 1              | 25                 | = 25         |
| SUBB    | 1              | 4                  | = 4          |
| JL      | 2              | 1                  | = 2          |
| RLC     | 1              | 2                  | = 2          |
| JC      | 2              | 6                  | = 12         |
| DEC     | 1              | 2                  | = 2          |
| DJNZ    | 2              | 2                  | = 4          |
| STMP    | 2              | 3                  | = 6          |
| JN/C    | 1              | 4                  | = 4          |
|         |                |                    | <hr/> 61     |

$$ET = (61 \times 12) \times 90 \text{ ns}$$

$$= \underline{\underline{65 \text{ } \mu\text{s}}}$$



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: Jithendra HS

### 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  $< 800\text{mV}$
- ☒ Oscillator functional (check for correct ALE/XTAL2 signals after power on-off cycles)
- ☒ EFM8 & ARM development boards functional, student can demonstrate the basic software.

### Student Answers to Lab Questions

- What voltage is present at the regulator input? Use a digital multimeter. 7.76 V
- What voltage is present at the regulator output? Use a digital multimeter. 4.99 V
- What peak to peak noise is present across the processor VCC and GND? Use an oscilloscope.

Top: 560mV

Measured value at processor package pins on top side of board: 1

Measured value at wire wrap socket pins on bottom side of board: Down: 360mV

- 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.

X1 = 270ms      X2 = 394ms

Measured value:  $\Delta X = 118\text{ms}$

- What frequency is present at the ALE pin? Use an oscilloscope. 1.843 MHz.

Aure  
09/29/2023

Instructor/TA Comments: ☐ ☐ ☐

TA signature and date

| FOR INSTRUCTOR USE ONLY                 | Not Applicable           | Poor/Not Complete        | Meets Requirements                  | Exceeds Requirements     | Outstanding              |
|---|--------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|
| Schematics, SPLD code                   | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Hardware physical implementation        | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Required Elements functionality         | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sign-off done without excessive retries | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Student understanding and skills        | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Overall Demo Quality                    | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Comments:

### Part 3 Comments

[+] Hardware Implementation

[+] Good soldering & wire wrap

[+] Decoupling capacitor present

[+] Label present

[+] Good knowledge of oscilloscope

[+] STM32 Code



## 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 Canvas to reduce paper usage. Canvas is <https://canvas.colorado.edu>.**

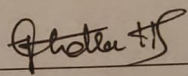
Remember, in addition to the items listed on the signoff checklist, be sure to review the lab for additional requirements for submission, including:

- ☐ Scan of signed and dated Part 1 & 2 Elements signoff sheet as the top sheet (No cover sheet please)
- ☐ Scan of signed and dated Part 3 Elements signoff sheet as the second sheet
- ☐ Scan of submission sheet with signed honor code pledge as the third sheet
- ☐ PDF of complete and accurate final schematic of acceptable quality (all components shown).
- ☐ Fully, neatly, and clearly commented assembly code.
- ☐ Clear high-resolution pictures of the top and bottom sides of your 8051 board. Must be able to read any silkscreen/labels on the board as well as zoom in and see the solder joints and wire wraps.

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

Student Name: Jithendra HS

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: 

1. How much power is dissipated in the regulator, assuming a load current of 210mA? 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.

$$P = VI$$

$$P_{diss} = \Delta V \times I$$

$$= 2.77 \times 218 \times 10^{-3}$$

$$= 0.603 \text{ Watts.}$$

$$\begin{aligned} \Delta V &= V_0 - I_1 \\ &= (4.99 - 2.26) \\ &= 2.77V \end{aligned}$$

$$\begin{aligned} I &= I_q + I_o \\ &= (8 \times 10^{-3} + 210 \times 10^{-3}) \\ &= 218 \times 10^{-3} \\ &= 218 \text{ mA} \end{aligned}$$

Calculated value: 0.603 watts

Comments:

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