LAB 1 Part 1 Signoff Sheet Calculations and Writeup

1. How many bytes of code space does your program require?

* 50 Bytes.
* The code size depends on the size of each executed instruction. The instruction byte size depends on the Opcode and Operand size of the instruction. Therefore, as calculated in the code execution table below, the total code size is 50 bytes.

1. How long did your program take to execute for X=0x60 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

* Total Execution time is 164.09 uSeconds.
* The Calculations along with the code execution table is shown below.

Code Execution Time Calculation:

|  |  |  |  |
| --- | --- | --- | --- |
| Instructions | Bytes | No. of Machine Cycles | Multiplier |
| BEGIN: CLR A | 1 | 1 | 1 |
| MOV 30H,A | 2 | 1 | 1 |
| CLR C | 1 | 1 | 1 |
| MOV A,#60H | 2 | 1 | 1 |
| RLC A | 1 | 1 | 1 |
| JNC NOERROR2 | 2 | 1 | 2 |
| MOV R0,#30H | 2 | 2 | Wasn’t executed for these values |
| MOV [R0],#02H | 2 | 1 | Wasn’t executed for these values |
| NOERROR2 :  MOV 20H,A | 2 | 1 | 1 |
| MOV B,#0AH | 3 | 2 | 1 |
| MOV R2,A | 1 | 1 | 1 |
| CLR A | 1 | 1 | 1 |
| SUBB A,B | 2 | 1 | 1 |
| JNZ NOERROR1 | 2 | 2 | 2 |
| MOV R0,#30H | 2 | 1 | Was not executed for these values |
| MOV [R0],#01H | 2 | 2 | Was not executed for these values |
| SJMP ENDLOOP | 2 | 2 | Was not executed for these values |
| NOERROR1:  CLR C | 1 | 1 | 1 |
| MOV A,R2 | 1 | 1 | 1 |
| MOV R0,#0H | 2 | 1 | 1 |
| DIV:  MOV R1,A | 1 | 1 | 19 |
| SUBB A,B | 2 | 2 | 19 |
| JNC INCR | 2 | 1 | 19 |
| MOV 22H,R1 | 2 | 1 | 2 |
| SJMP FINAL | 2 | 2 | 2 |
| INCR:INC R0 | 1 | 1 | 19 |
| SJMP DIV | 2 | 2 | 19 |
| FINAL: MOV 21H,R0 | 2 | 2 | 1 |
| ENDLOOP : SJMP ENDLOOP | 2 | 1 | 2 |
| Total | 50 |  | 154 |

Calculation for the Execution time

Frequency used = 11.0592 MHz

Total Machine Cycles = 154

1 machine cycle = 12 oscillator periods

1 oscillator cycle = 90 ns

1 Machine cycle = 90ns x12 = 1.085 ms

Total time taken by the program to execute,

= 154 x 1.085

= 167.09 microseconds

Gained Outcomes from Lab 1 Part 1 :

1. Assembly language: Got acquainted with the 8051 assembly language and the instruction set in it. The code helped me to delve into the different types of instructions like the Jump instructions, arithmetic and logical instructions and also with the different addressing modes present in the instruction set.
2. Architecture Overview: To use the registers such as accumulator and internal RAM for developing the assembly code, I got an opportunity to speculate and learn the architecture of 8051 and its working at an intermediate level.
3. Emily52 and Edsim51: This lab helped me to understand and learn both the softwares and demonstrated both of them to the TA. These softwares helped me to cognize, how the registers store the data in actual using features such as single stepping mode. Also , I got acquainted with the use of breakpoints in the code and the method with which we can edit data memory and register values.
4. WinCupl and WinSim: These softwares allowed me to design our own input logic based SPLDs to obtain the desired output. Also, the feature of function simulation helped me to simulate and observe the output waveforms on giving different combinations of high and low inputs to the SPLD. Thus, for the SPLD implemented in the lab with inputs A15, A14, A13, A12, RD and PSEN, the output waveforms can be observed in the screenshot attached below.

