Lab 5

25 March 2013

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Objective-

The objective of this lab was to learn how to use the timer while using the LEDs.

Equipment used-

Software: a text editor and an 8051 ASM assembler

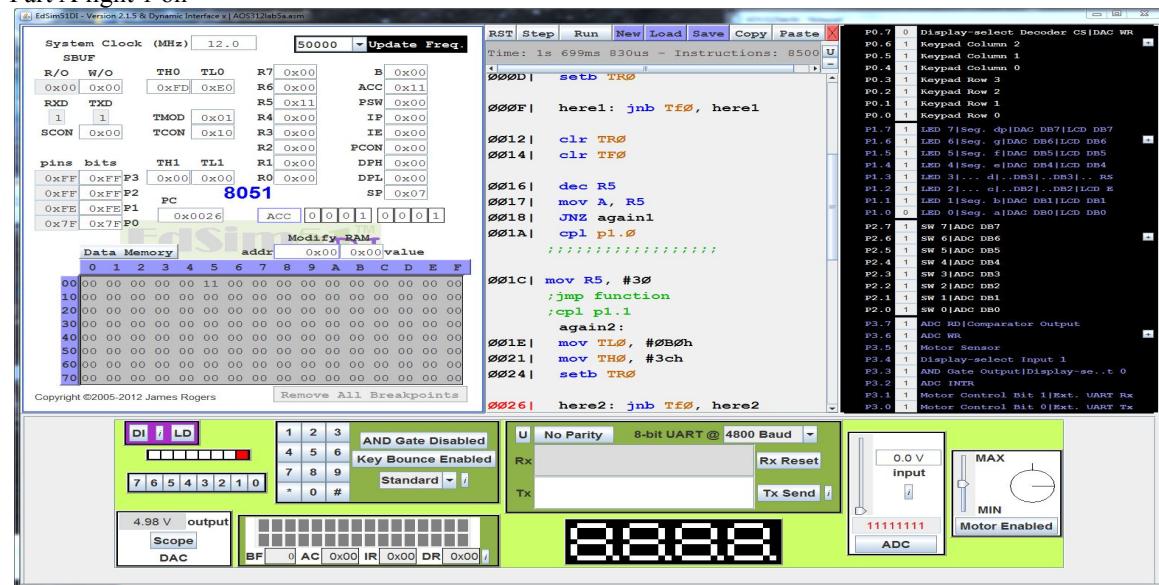A step debugger that can be used to execute a program one step at

a time

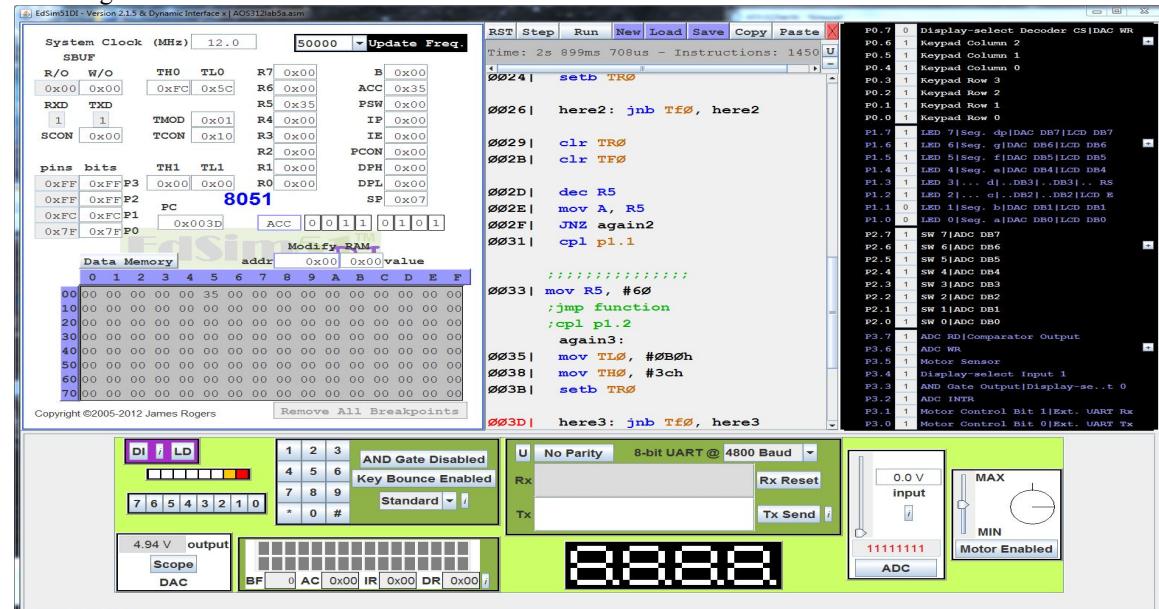Register, code memory, data memory, and input/output port

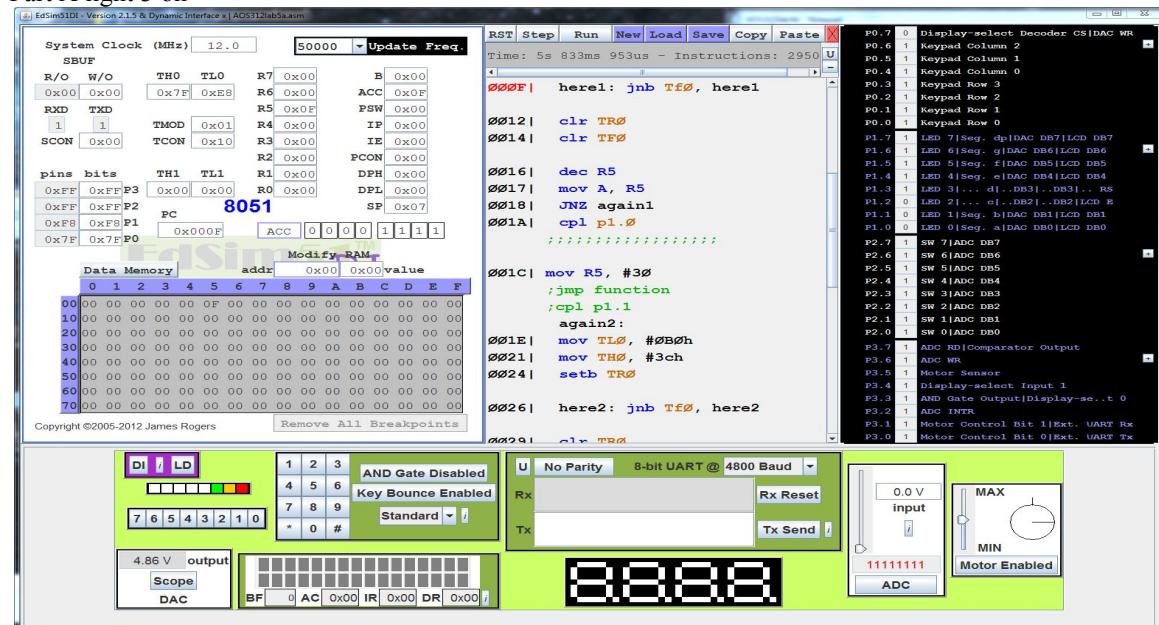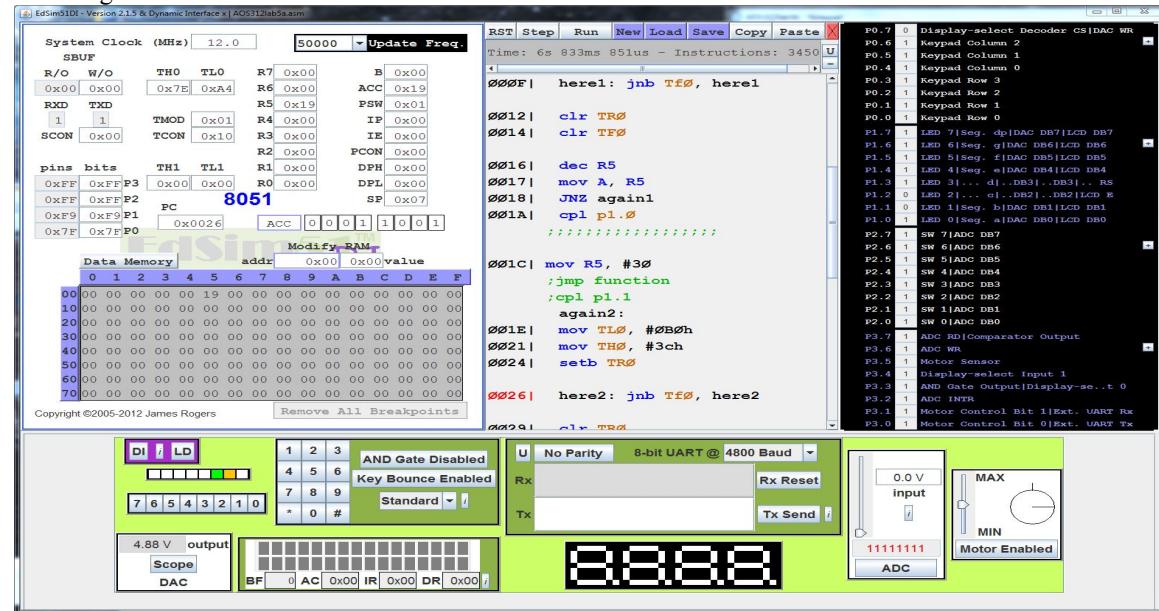contents are displayed to aid debugging.
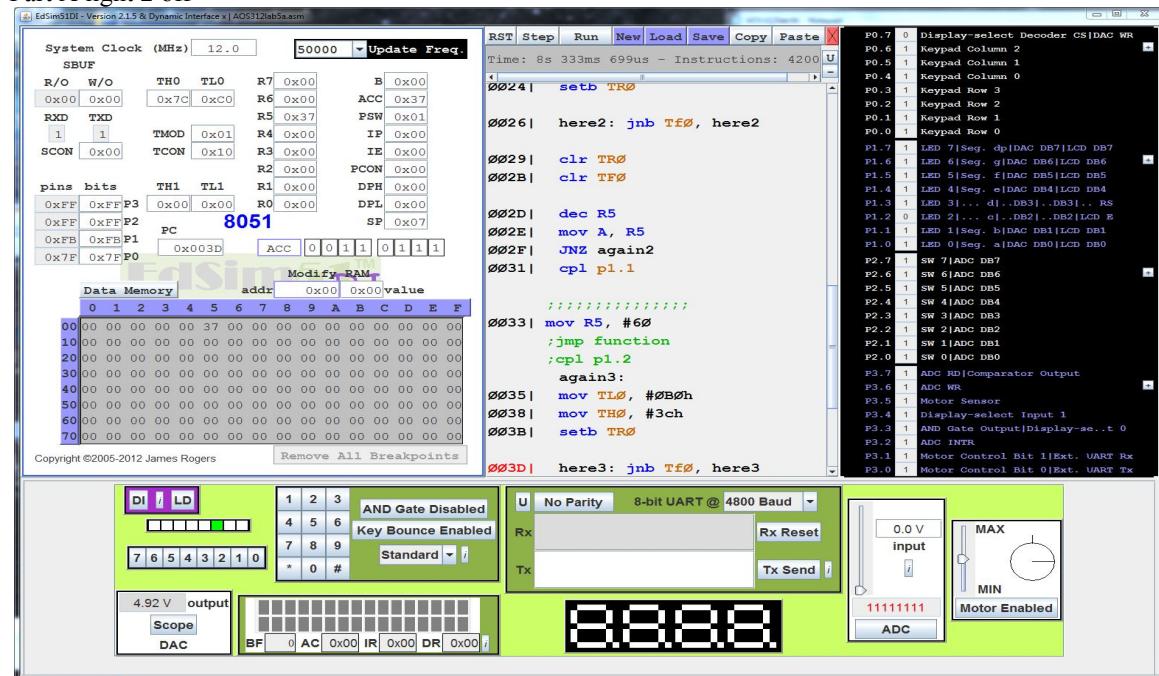
Test Results-

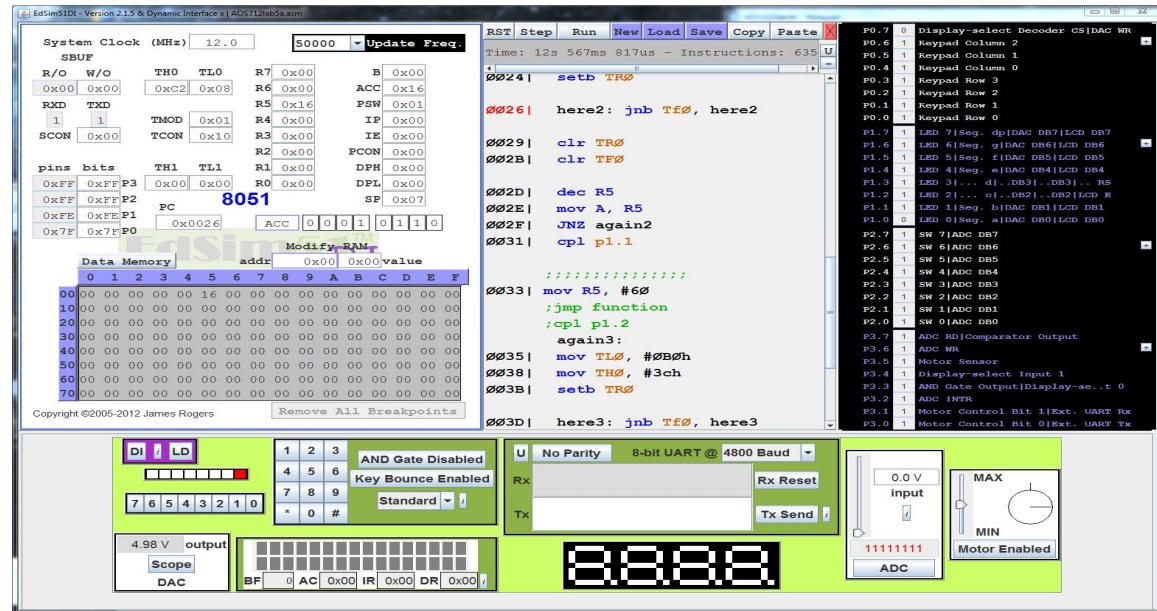Part A light 1 on
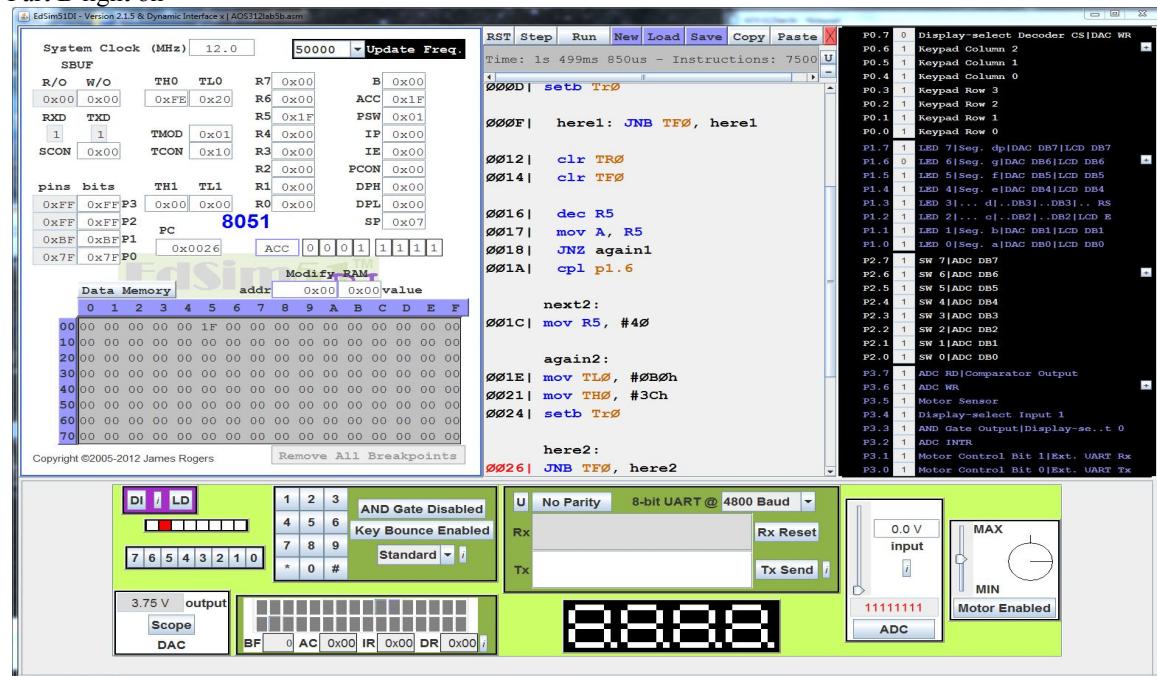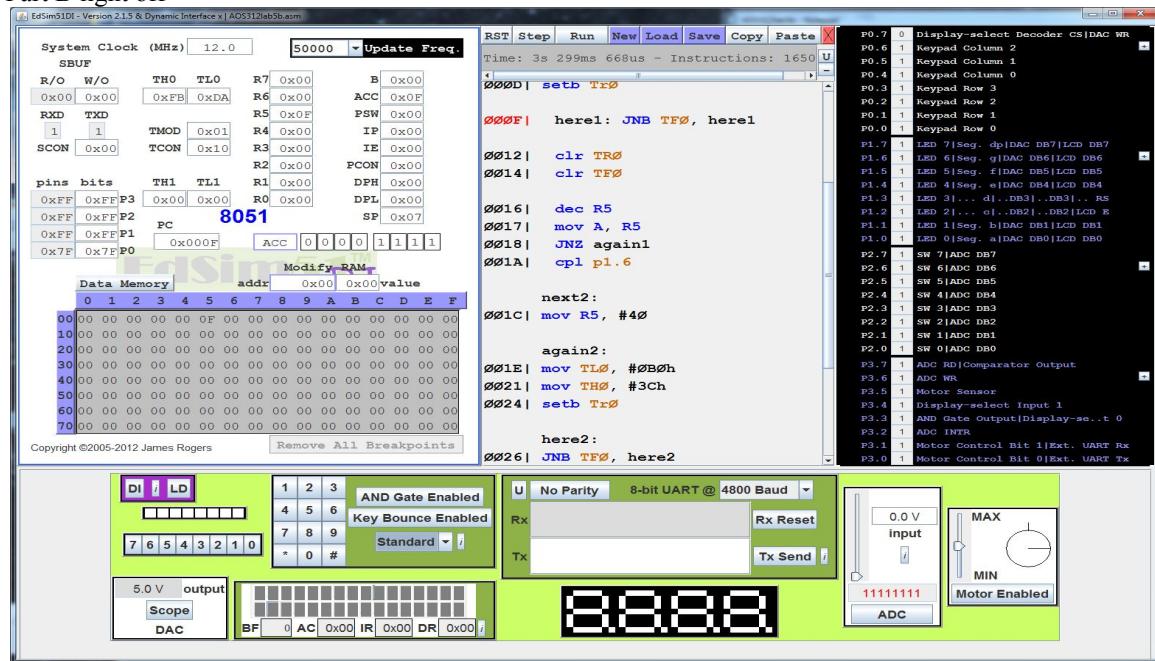
Part A light 2 on

Part A light 3 on

Part A light 1 off

EdSim51DI - Version 2.1.5 & Dynamic Interface x | AOS312lab5a.asm

System Clock (MHz) 12.0   50000 ▼ Update Freq.

SBUF

R/O	W/O		THO	TL0	R7	0x00		B	0x00
0x00	0x00		0x7E	0xA4	R6	0x00		ACC	0x19
RXD	TXD				R5	0x19		PSW	0x01
1			TMOD	0x01	R4	0x00		IP	0x00
SCON	0x00		TCON	0x10	R3	0x00		IE	0x00
					R2	0x00		PCON	0x00

pins bits   TH1 TL1   R1 0x00   DPH 0x00
0xFF 0xFF P3 0x00 0x00 R0 0x00 DPL 0x00
0xFF 0xFF P2   SP 0x07
0xF9 0xF9 P1   PC   **8051**
0x7F 0x7F P0   0x0026   ACC 0 0 0 1 1 0 0 1

Modify RAM
addr 0x00 0x00 value

Data Memory

```
   0 1 2 3 4 5 6 7 8 9 A B C D E F
00 00 00 00 00 00 19 00 00 00 00 00 00 00 00 00 00
10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
20 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
50 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
60 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

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RST Step Run New Load Save Copy Paste
Time: 6s 833ms 851us - Instructions: 3450

000F| here1: jnb Tf0, here1

0012| clr TR0
0014| clr TF0

0016| dec R5
0017| mov A, R5
0018| JNZ again1
001A| cpl p1.0
         ;;;;;;;;;;;;;;;;

001C| mov R5, #30
         ;jmp function
         ;cpl p1.1
         again2:
001E| mov TL0, #0B0h
0021| mov TH0, #3ch
0024| setb TR0

0026| here2: jnb Tf0, here2

0029| clr TR0

P0.7 0 Display-select Decoder CS|DAC WR
P0.6 1 Keypad Column 2
P0.5 1 Keypad Column 1
P0.4 1 Keypad Column 0
P0.3 1 Keypad Row 3
P0.2 1 Keypad Row 2
P0.1 1 Keypad Row 1
P0.0 1 Keypad Row 0
P1.7 1 LED 7|Seg. dp|DAC DB7|LCD DB7
P1.6 1 LED 6|Seg. g|DAC DB6|LCD DB6
P1.5 1 LED 5|Seg. f|DAC DB5|LCD DB5
P1.4 1 LED 4|Seg. e|DAC DB4|LCD DB4
P1.3 1 LED 3|... d|..DB3|..DB3|.. RS
P1.2 1 LED 2|... c|..DB2|..DB2|LCD E
P1.1 0 LED 1|Seg. b|DAC DB1|LCD DB1
P1.0 1 LED 0|Seg. a|DAC DB0|LCD DB0
P2.7 1 SW 7|ADC DB7
P2.6 1 SW 6|ADC DB6
P2.5 1 SW 5|ADC DB5
P2.4 1 SW 4|ADC DB4
P2.3 1 SW 3|ADC DB3
P2.2 1 SW 2|ADC DB2
P2.1 1 SW 1|ADC DB1
P2.0 1 SW 0|ADC DB0
P3.7 1 ADC RD|Comparator Output
P3.6 1 ADC WR
P3.5 1 Motor Sensor
P3.4 1 Display-select Input 1
P3.3 1 AND Gate Output|Display-se..t 0
P3.2 1 ADC INTR
P3.1 1 Motor Control Bit 1|Ext. UART Rx
P3.0 1 Motor Control Bit 0|Ext. UART Tx

DI / LD

7 6 5 4 3 2 1 0

1 2 3
4 5 6
7 8 9
* 0 #

AND Gate Disabled
Key Bounce Enabled
Standard ▼

U No Parity 8-bit UART @ 4800 Baud ▼
Rx   Rx Reset
Tx   Tx Send

0.0 V
input

11111111
ADC

MAX
MIN
Motor Enabled

4.88 V output
Scope
DAC

BF 0 AC 0x00 IR 0x00 DR 0x00

Part A light 2 off

EdSim51DI - Version 2.1.5 & Dynamic Interface x | AOS312lab5a.asm

System Clock (MHz) 12.0   50000 ▼ Update Freq.

SBUF

R/O	W/O		THO	TL0	R7	0x00		B	0x00
0x00	0x00		0x7C	0xC0	R6	0x00		ACC	0x37
RXD	TXD				R5	0x37		PSW	0x01
1	1		TMOD	0x01	R4	0x00		IP	0x00
SCON	0x00		TCON	0x10	R3	0x00		IE	0x00
					R2	0x00		PCON	0x00

pins bits   TH1 TL1   R1 0x00   DPH 0x00
0xFF 0xFF P3 0x00 0x00 R0 0x00 DPL 0x00
0xFF 0xFF P2   SP 0x07
0xFB 0xFB P1   PC   **8051**
0x7F 0x7F P0   0x003D   ACC 0 0 1 1 0 1 1 1

Modify RAM
addr 0x00 0x00 value

Data Memory

```
   0 1 2 3 4 5 6 7 8 9 A B C D E F
00 00 00 00 00 00 37 00 00 00 00 00 00 00 00 00 00
10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
20 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
50 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
60 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

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RST Step Run New Load Save Copy Paste
Time: 8s 333ms 699us - Instructions: 4200

0024| setb TR0

0026| here2: jnb Tf0, here2

0029| clr TR0
002B| clr TF0

002D| dec R5
002E| mov A, R5
002F| JNZ again2
0031| cpl p1.1

         ;;;;;;;;;;;;;;;;
0033| mov R5, #60
         ;jmp function
         ;cpl p1.2
         again3:
0035| mov TL0, #0B0h
0038| mov TH0, #3ch
003B| setb TR0

003D| here3: jnb Tf0, here3

P0.7 0 Display-select Decoder CS|DAC WR
P0.6 1 Keypad Column 2
P0.5 1 Keypad Column 1
P0.4 1 Keypad Column 0
P0.3 1 Keypad Row 3
P0.2 1 Keypad Row 2
P0.1 1 Keypad Row 1
P0.0 1 Keypad Row 0
P1.7 1 LED 7|Seg. dp|DAC DB7|LCD DB7
P1.6 1 LED 6|Seg. g|DAC DB6|LCD DB6
P1.5 1 LED 5|Seg. f|DAC DB5|LCD DB5
P1.4 1 LED 4|Seg. e|DAC DB4|LCD DB4
P1.3 1 LED 3|... d|..DB3|..DB3|.. RS
P1.2 1 LED 2|... c|..DB2|..DB2|LCD E
P1.1 1 LED 1|Seg. b|DAC DB1|LCD DB1
P1.0 1 LED 0|Seg. a|DAC DB0|LCD DB0
P2.7 1 SW 7|ADC DB7
P2.6 1 SW 6|ADC DB6
P2.5 1 SW 5|ADC DB5
P2.4 1 SW 4|ADC DB4
P2.3 1 SW 3|ADC DB3
P2.2 1 SW 2|ADC DB2
P2.1 1 SW 1|ADC DB1
P2.0 1 SW 0|ADC DB0
P3.7 1 ADC RD|Comparator Output
P3.6 1 ADC WR
P3.5 1 Motor Sensor
P3.4 1 Display-select Input 1
P3.3 1 AND Gate Output|Display-se..t 0
P3.2 1 ADC INTR
P3.1 1 Motor Control Bit 1|Ext. UART Rx
P3.0 1 Motor Control Bit 0|Ext. UART Tx

DI / LD

7 6 5 4 3 2 1 0

1 2 3
4 5 6
7 8 9
* 0 #

AND Gate Disabled
Key Bounce Enabled
Standard ▼

U No Parity 8-bit UART @ 4800 Baud ▼
Rx   Rx Reset
Tx   Tx Send

0.0 V
input

11111111
ADC

MAX
MIN
Motor Enabled

4.92 V output
Scope
DAC

BF 0 AC 0x00 IR 0x00 DR 0x00

Reset

```
00024|   setb TR0

0026|  here2: jnb Tf0, here2

0029|   clr TR0
002B|   clr TF0

002D|   dec R5
002E|   mov A, R5
002F|   JNZ again2
0031|   cpl p1.1

       ;;;;;;;;;;;;;;;;
0033|  mov R5, #60
       ;jmp function
       ;cpl p1.2
       again3:
0035|   mov TL0, #0B0h
0038|   mov TH0, #3ch
003B|   setb TR0

003D|  here3: jnb Tf0, here3
```

Part B light on

```
000D|   setb Tr0

000F|  here1: JNB TF0, here1

0012|   clr TR0
0014|   clr TF0

0016|   dec R5
0017|   mov A, R5
0018|   JNZ again1
001A|   cpl p1.6

       next2:
001C|  mov R5, #40

       again2:
001E|  mov TL0, #0B0h
0021|  mov TH0, #3Ch
0024|  setb Tr0

       here2:
0026|  JNB TF0, here2
```

Part B light off

Flow Chart-

Conclusion-

This lab was effective in teaching me how to use the 8051 timer. I learned how to use it in conjunction with the LED lights.

Program-
Part A

```
Org 0h
clr p0.7
mov tmod, #01
;function:
...............
;;;;;;;;;;;;;;;;;
mov R5, #20
        again1:
        mov TL0, #0B0h
        mov TH0, #3ch
        setb TR0
        here1: jnb Tf0, here1
        clr TR0
        clr TF0
        dec R5
        mov A, R5
        JNZ again1
        cpl p1.0
...................
;;;;;;;;;;;;;;;;;;;
mov R5, #30
        again2:
        mov TL0, #0B0h
        mov TH0, #3ch
        setb TR0
        here2: jnb Tf0, here2
        clr TR0
        clr TF0
        dec R5
        mov A, R5
        JNZ again2
        cpl p1.1
...............
;;;;;;;;;;;;;;;;;
mov R5, #60
        again3:
        mov TL0, #0B0h
        mov TH0, #3ch
        setb TR0
        here3: jnb Tf0, here3
        clr TR0
        clr TF0
        dec R5
        mov A, R5
        JNZ again3
        cpl p1.2
end
```

```
Org 0h
clr p0.7
mov TMOD, #01
next1:
mov R5, #20
again1:
mov TL0, #0B0h
mov TH0, #3Ch
setb Tr0
        here1: JNB TF0, here1
        clr TR0
        clr TF0
        dec R5
        mov A, R5
        JNZ again1
        cpl p1.6
next2:
mov R5, #40
again2:
mov TL0, #0B0h
mov TH0, #3Ch
setb Tr0
here2:
JNB TF0, here2
clr TR0
clr TF0
dec R5
mov A, R5
JNZ again2
cpl p1.6
ljmp next1
End
```

Part B