

Embedded System Lab (CS-16203)

Assignment-7

□ Write Program in KEIL Embedded C:

1. Write a C program for the 8051 to display a pattern of AA and 55h on port P1 with the delay of 100 ms.

Ans 1.

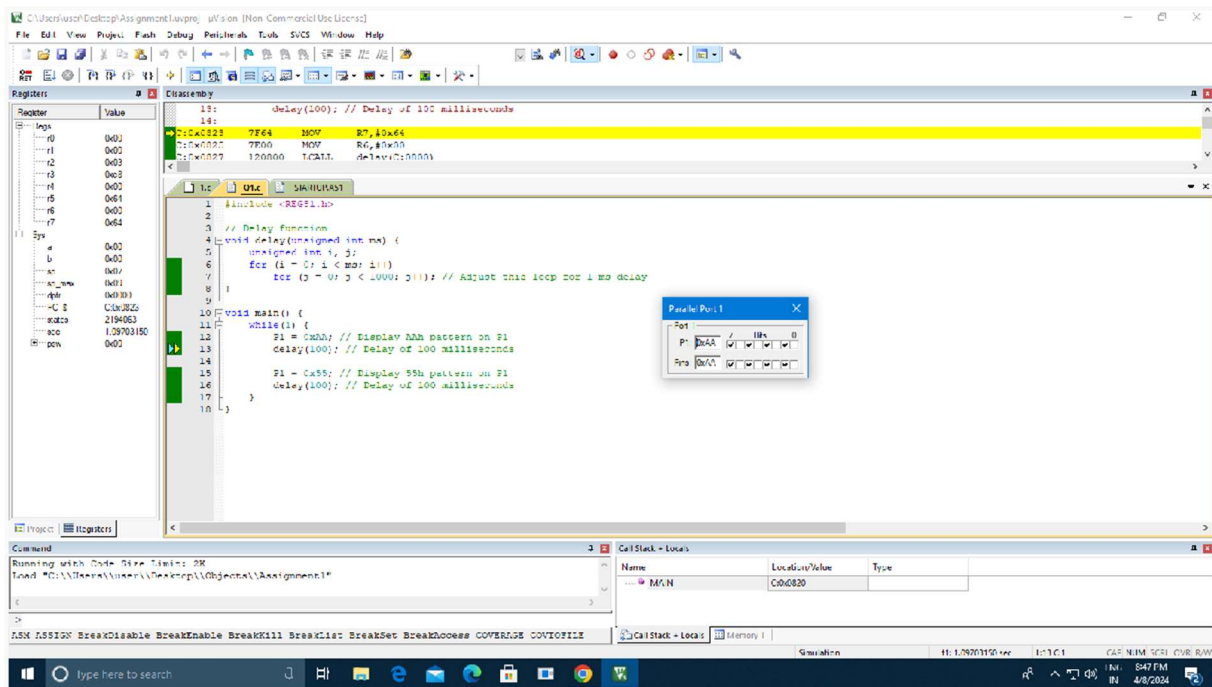
```
#include <REG51.h>
```

```
// Delay function
```

```
void delay(unsigned int ms) {  
    unsigned int i, j;  
    for (i = 0; i < ms; i++)  
        for (j = 0; j < 1000; j++); // Adjust this loop for 1 ms delay  
}
```

```
void main() {  
    while(1) {  
        P1 = 0xAA; // Display AAh pattern on P1  
        delay(100); // Delay of 100 milliseconds  
  
        P1 = 0x55; // Display 55h pattern on P1  
        delay(100); // Delay of 100 milliseconds  
    }  
}
```

Output –



2. Write an 8051 C program to get a byte of data from P0. If it is less than 100, send it to P1; otherwise, send it to P2.

Ans 2.

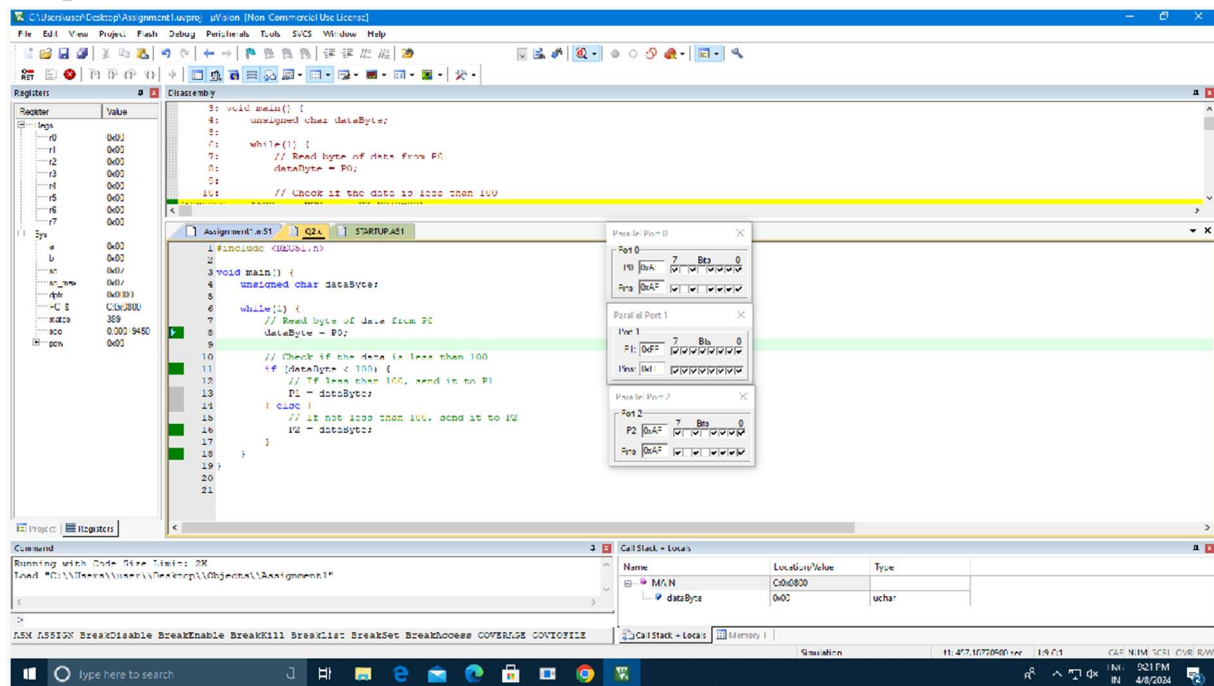
```
#include <REG51.h>
```

```
void main() {
    unsigned char dataByte;

    while(1) {
        // Read byte of data from P0
        dataByte = P0;

        // Check if the data is less than 100
        if (dataByte < 100) {
            // If less than 100, send it to P1
            P1 = dataByte;
        } else {
            // If not less than 100, send it to P2
            P2 = dataByte;
        }
    }
}
```

Output –



3. Write an 8051 C program to convert 11111101 (FD hex) to decimal and display the digits on P0, P1 and P2.

Ans 3.

```
#include <REG51.h>
```

```
void main() {
```

```
    unsigned char hexNumber = 0xFD; // Hexadecimal number FD
```

```
    unsigned char digitP0, digitP1, digitP2;
```

```
    // Extract individual digits from the hexadecimal number
```

```
    digitP0 = hexNumber % 10; // Ones place
```

```
    hexNumber /= 10;
```

```
    digitP1 = hexNumber % 10; // Tens place
```

```
    hexNumber /= 10;
```

```
    digitP2 = hexNumber % 10; // Hundreds place
```

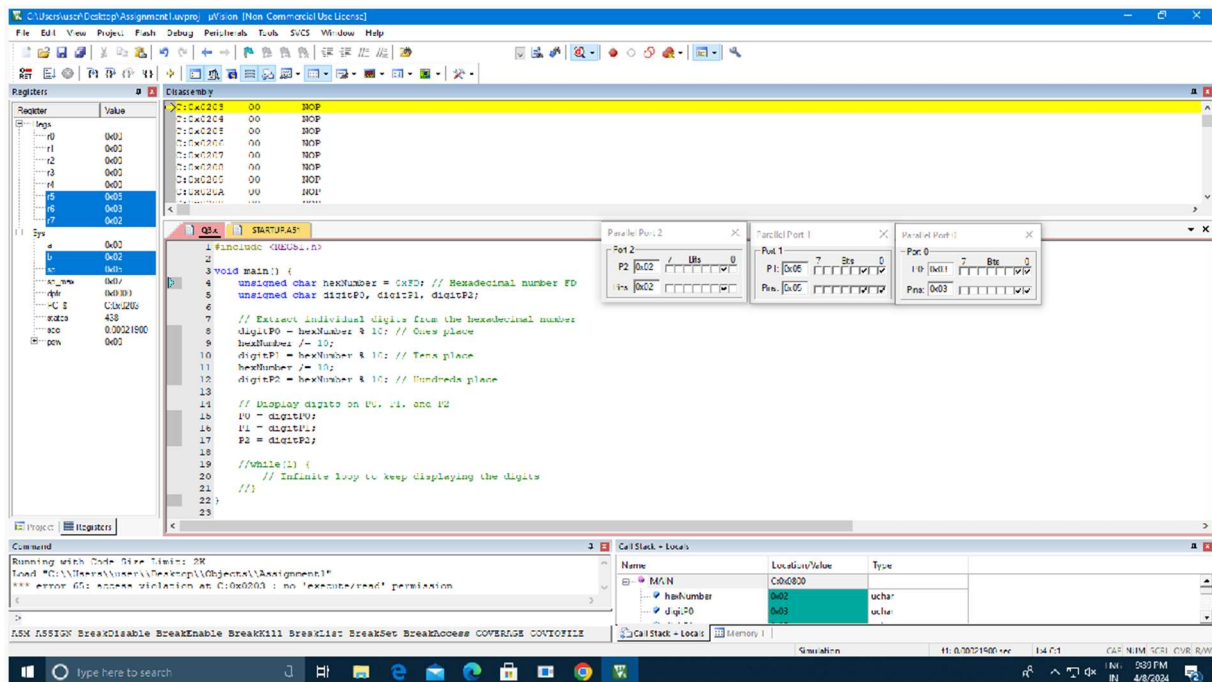
```
    // Display digits on P0, P1, and P2
```

```
    P0 = digitP0;
```

```
    P1 = digitP1;
```

```
    P2 = digitP2;
```

}
Output –



□ To be done using EdSim51 simulator in 8051:

1. Write a Program to check whether a number is palindrome or not. If palindrome store FFh in accumulator.

Ans 1.

ORG 0000H

MOV DPTR,#8000H

MOVX A,@DPTR

MOV R0, A

MOV R2, #00H

BACK: MOV B, #0AH

DIV AB

MOV B, A

MUL AB

SUBB A, R0

JNZ NOT_PALINDROME

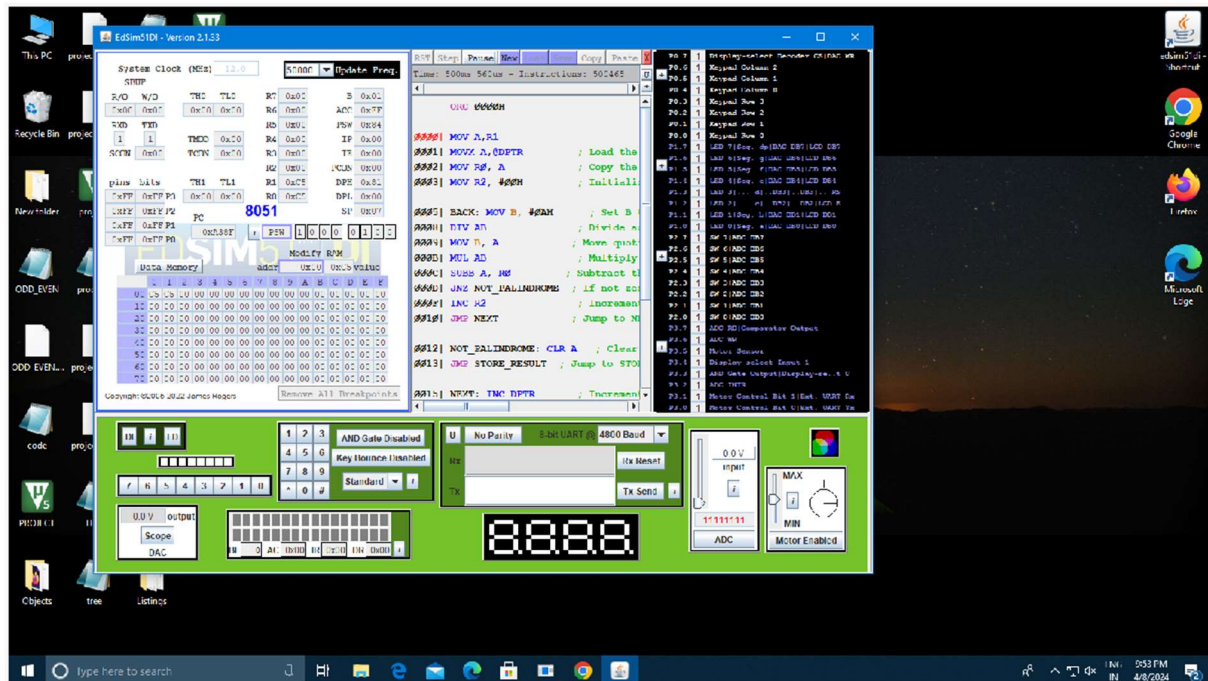
INC R2

JMP NEXT

```
NOT_PALINDROME: CLR A
JMP STORE_RESULT
```

```
NEXT: INC DPTR
MOVX A, @DPTR
CJNE A, #0FFH, BACK
JMP STORE_RESULT
```

```
STORE_RESULT: MOV A, #0FFH
MOV DPTR, #8100H
MOVX @DPTR, A
END
```



2. Write an assembly language program to compute prime factors of a number.

Ans 2.

```
mov r2,#3Ch
mov r1,#30h
mov r0,#02h
```

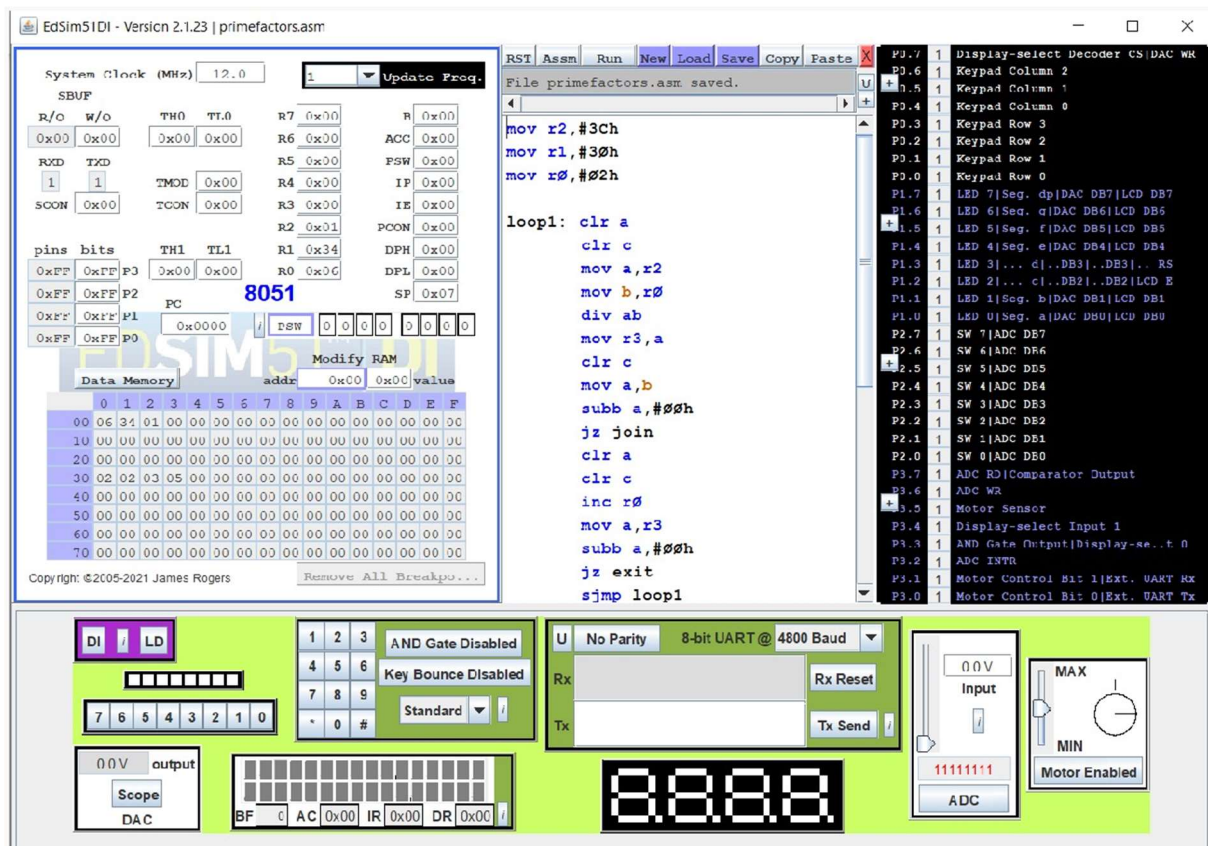
```
loop1: clr a
```

```
    clr c
    mov a,r2
    mov b,r0
    div ab

    mov r3,a
    clr c
    mov a,b
    subb a,#00h
    jz join
    clr a
    clr c
    inc r0
    mov a,r3
    subb a,#00h
    jz exit
    sjmp loop1
```

```
join: mov a,r0
      mov @r1,a
      inc r1
      mov a,r3
      mov r2,a
      sjmp loop1
```

```
exit: nop
end
```



3. Write an assembly language program to print Binary Pattern on the Port 1

Ans 3.

ORG 0000H

START: MOV P1,#00000000B

LOOP: MOV A,P1

CPL A

MOV P1,A

CALL DELAY

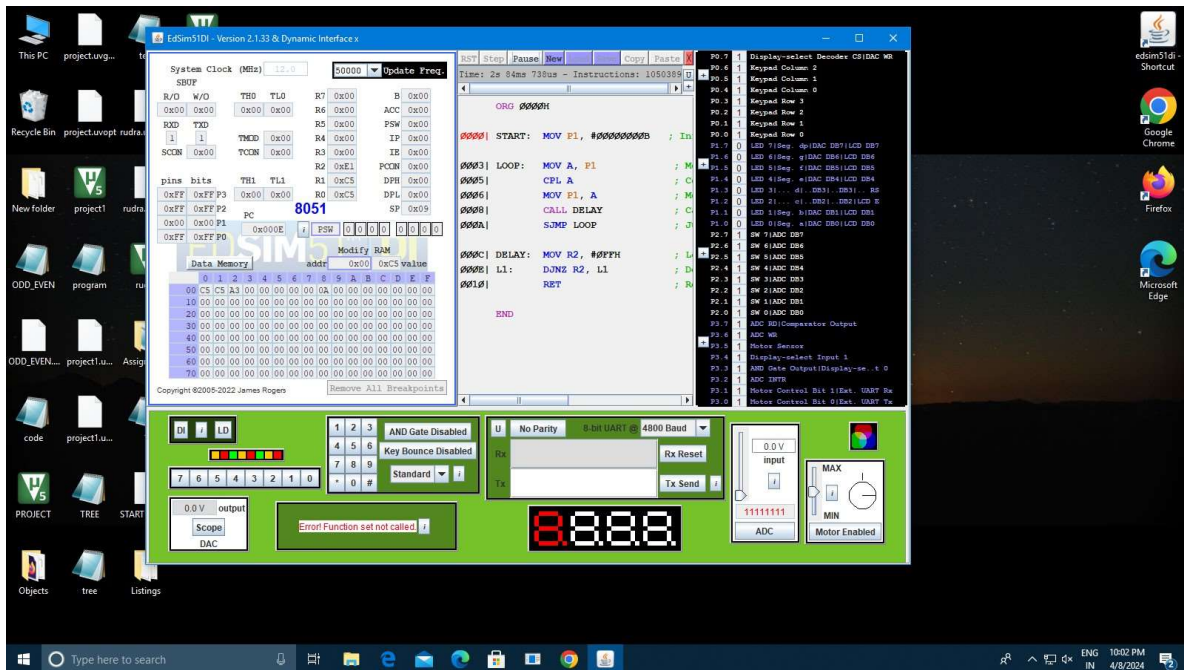
SJMP LOOP

DELAY: MOV R2,#0FFH

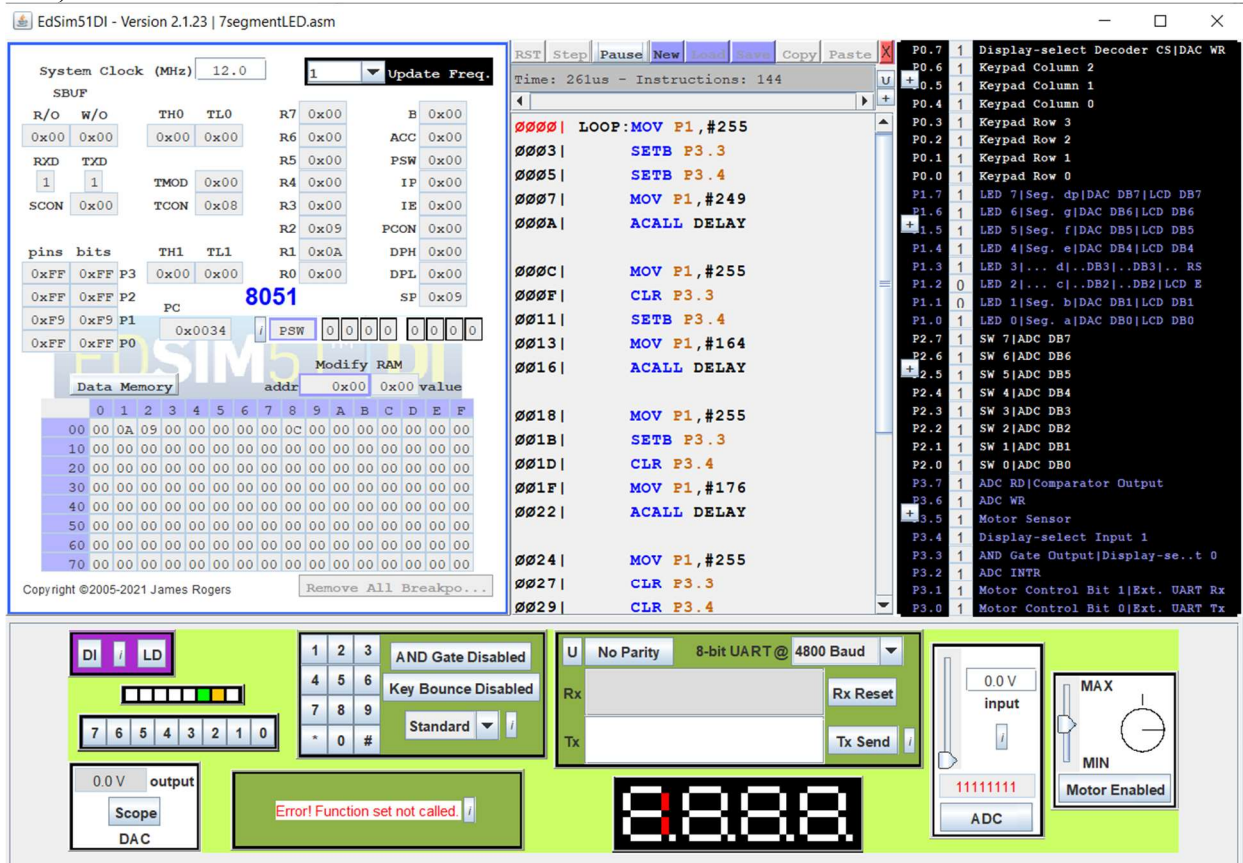
L1: DJNZ R2,L1

RET

END



4) Write an assembly Language program that multiplexes the number 1234 on the four 7-segment displays
 Ans)



EdSim51DI - Version 2.1.23 | 7segmentLED.asm

System Clock (MHz) 12.0 Update Freq. 1

SBUF

R/O	W/O	TH0	TL0	R7	B
0x00	0x00	0x00	0x00	0x00	0x00

RxD	TxD	TMOD	R4	PSW
1	1	0x00	0x00	0x00

SCON	TCON	R3	IE	PCON
0x00	0x08	0x00	0x00	0x00

pins bits TH1 TL1

0xF7	0xF7	P3	0x00	0x00
0xFF	0xFF	P2	0x00	0x00

0xA4 0xA4 P1 0x0034

0xFF 0xFF P0

Modify RAM

Data Memory

addr 0x00 0x00 value

0 1 2 3 4 5 6 7 8 9 A B C D E F

00 00 09 09 00 00 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

20 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

40 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

60 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

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RST Step Pause New Load Save Copy Paste

Time: 922us - Instructions: 506

```
0000| LOOP:MOV P1,#255
0003| SETB P3.3
0005| SETB P3.4
0007| MOV P1,#249
000A| ACALL DELAY
000C| MOV P1,#255
000F| CLR P3.3
0011| SETB P3.4
0013| MOV P1,#164
0016| ACALL DELAY
0018| MOV P1,#255
001B| SETB P3.3
001D| CLR P3.4
001F| MOV P1,#176
0022| ACALL DELAY
0024| MOV P1,#255
0027| CLR P3.3
0029| CLR P3.4
```

P0.7 1 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 0 LED 6|Seg. g|DAC DB6|LCD DB6
P1.5 1 LED 5|Seg. f|DAC DB5|LCD DB5
P1.4 0 LED 4|Seg. e|DAC DB4|LCD DB4
P1.3 0 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 0 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 0 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

1 2 3 AND Gate Disabled
4 5 6 Key Bounce Disabled
7 8 9 Standard
* 0 #

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

0.0V output
Scope DAC

Error! Function set not called.

0.0V input
11111111
ADC

MAX
MIN
Motor Enabled

8888

EdSim51DI - Version 2.1.23 | 7segmentLED.asm

System Clock (MHz) 12.0 Update Freq. 1

SBUF

R/O	W/O	TH0	TL0	R7	B
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RxD	TxD	TMOD	R4	PSW
1	1	0x00	0x00	0x00

SCON	TCON	R3	IE	PCON
0x00	0x08	0x00	0x00	0x00

pins bits TH1 TL1

0xFF	0xFF	P3	0x00	0x00
0xFF <td>0xFF</td> <td>P2</td> <td>0x00</td> <td>0x00</td>	0xFF	P2	0x00	0x00

0xB0 0xB0 P1 0x0034

0xFF 0xFF P0

Modify RAM

Data Memory

addr 0x00 0x00 value

0 1 2 3 4 5 6 7 8 9 A B C D E F

00 00 04 09 00 00 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

20 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

40 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

60 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

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RST Step Pause New Load Save Copy Paste

Time: 2ms 97us - Instructions: 1149

```
0000| LOOP:MOV P1,#255
0003| SETB P3.3
0005| SETB P3.4
0007| MOV P1,#249
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000F| CLR P3.3
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P0.5 1 Keypad Column 1
P0.4 1 Keypad Column 0
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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 0 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 0 LED 3|... d|...DB3|...DB3|... RS
P1.2 0 LED 2|... c|...DB2|...DB2|LCD E
P1.1 0 LED 1|Seg. b|DAC DB1|LCD DB1
P1.0 0 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 0 Display-select Input 1
P3.3 0 AND Gate Output|Display-se..t 0
P3.2 1 ADC INTR
P3.1 1 Motor Control Bit 1|Ext. UART Rx
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EdSim51DI - Version 2.1.23 | 7segmentLED.asm

System Clock (MHz) 12.0

1 Update Freq.

R/O W/O TH0 TL0 R7 0x00 B 0x00

0x00 0x00 0x00 0x00 R6 0x00 ACC 0x00

RxD TXD TMD 0x00 R5 0x00 PSW 0x00

1 1 SCON 0x00 TCON 0x08 R4 0x00 IP 0x00

pins bits TH1 TL1 R3 0x00 IE 0x00

0xE7 0xE7 P3 0x00 0x00 R2 0x09 PCON 0x00

0xFF 0xFF P2 PC 8051 SP 0x09

0x99 0x99 P1 PSW 0 0 0 0 0 0 0 0

0xFF 0xFF P0 0x0034 0 0 0 0 0 0 0 0

Data Memory

addr 0x00 0x00 value

0 1 2 3 4 5 6 7 8 9 A B C D E F

00 00 0A 09 00 00 00 00 00 30 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 Pause New Load Save Copy Paste

Time: 2ms 496us - Instructions: 1368

0000| LOOP:MOV P1,#255

0003| SETB P3.3

0005| SETB P3.4

0007| MOV P1,#249

000A| ACALL DELAY

000C| MOV P1,#255

000F| CLR P3.3

0011| SETB P3.4

0013| MOV P1,#164

0016| ACALL DELAY

0018| MOV P1,#255

001B| SETB P3.3

001D| CLR P3.4

001F| MOV P1,#176

0022| ACALL DELAY

0024| MOV P1,#255

0027| CLR P3.3

0029| CLR P3.4

P0.7 1 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 0 LED 6|Seg. g|DAC DB6|LCD DB6

P1.5 0 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 0 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 0 Display-select Input 1

P3.3 0 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

0.0 V output

Scope DAC

1 2 3 AND Gate Disabled

4 5 6 Key Bounce Disabled

7 8 9 Standard

* 0 #

U No Parity 8-bit UART @ 4800 Baud

Rx Rx Reset

Tx Tx Send

0.0 V input

11111111

ADC

MAX

MIN

Motor Enabled

Error Function set not called

8.8.8.8