Embedded System Lab 08 (CS-16203)

Note: *In case, the problem can have multiple solutions please explore each of them.*

To be done in Edsim51 Simulator:

1. Suppose you are given 16 bit binary data, you are required to compute the number of 1's that the binary data have and display on a seven segment display.

Solution:

```
ORG 0
MOV R0,#0FFH  ;MSB
MOV R1,#0FFH  ;LSB
MOV R2,#08
MOV R3,#08
MOV R4,#0

MOV A,R1
LSBCOUNT:  RLC A
        JNC TEMP
        INC R4
                TEMP:DJNZ R2,LSBCOUNT

MOV A,R0
MSBCOUNT:  RLC A
                JNC TEMP1
        INC R4
                TEMP1:DJNZ R3,MSBCOUNT

MOV B,#10
MOV A,R4
DIV AB
SETB P3.3
SETB P3.4
LCALL DISPLAY
```

```
MOV A,B
MOV P1,#255
CLR P3.3
SETB P3.4
LCALL DISPLAY

SJMP FINISH
DISPLAY:CJNE A,#0,C1
        MOV P1,#192
        RET
        C1:CJNE A,#01,C2
        MOV P1,#249
        RET
        C2:CJNE A,#02,C3
        MOV P1,#164
        RET
        C3:CJNE A,#03,C4
        MOV P1,#176
        RET
        C4:CJNE A,#04,C5
        MOV P1,#153
        RET
        C5:CJNE A,#05,C6
        MOV P1,#146
        RET
        C6:CJNE A,#06,C7
        MOV P1,#130
        RET
        C7:CJNE A,#07,C8
        MOV P1,#248
        RET
        C8:CJNE A,#08,C9
        MOV P1,#128
        RET
        C9:CJNE A,#09,OVERFLOW
        MOV P1,#144
        RET
```

```
OVERFLOW:RET

FINISH:

END
```

1. Write a simple program to generate a square wave with some delay using Edsim51 simulator

Solution:

```
CLR P0.7
BACK: MOV A,#00H;
CALL DELAY
MOV A,#0FFH;
MOV P1,A;
CALL DELAY
LJMP BACK
DELAY:MOV R2,#02FH;
UP:DJNZ R2,UP
RET
```

2. Write a program to generate a square wave of 2 KHz frequency on Pin

1.5. You are required to use a timer in mode 1. Assume that XTAL=11.0592MHz.

Solution:

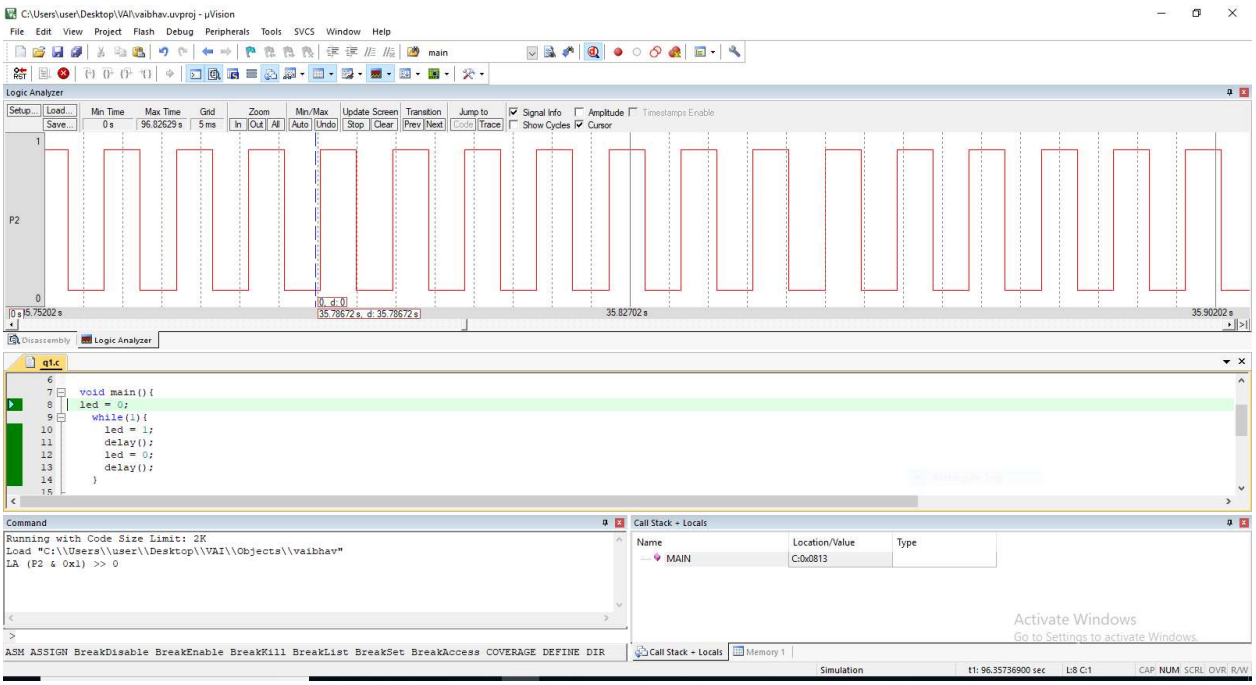
```
#include<reg51.h>

        sbit led = P1^5;

        void delay(void);

void main(){
        led = 0;
                while(1){
                 led=~led;
                }
}


void delay(){
        TMOD = 0x01;
        TH0 = 0xDc;
        TL0 = 0x00;
        TR0 = 1;
        while(TF0 == 0);
        TR0 = 0;
        TF0 = 0;
}
```



3. Write a program that continuously gets 8-bit data from P0 and sends it to P1 while simultaneously creating a square wave of 200 micro sec period on pin P2.1. Use timer1 to create the square wave. Assume that XTAL=11.0592MHz.

Solution:

```
;Upon wake-up go to main avoid using memory space
;allocated to Interrupt Vector Table
    ORG 0000H
    LJMP MAIN        ;bypass interrupt vector table

;ISR for Timer 0 to generate square wave
    ORG 000BH        ;Timer 0 interrupt vector table
    CPL p2.1     ;toggle p2.1 pin
    RETI         ;return from ISR

;The main program for initialization
    ORG 0030H  ;after vector table space
MAIN:MOV TMOD,#02H          ;Timer 0,mode 2(auto-reload)
     MOV p0,#0FFH           ;make P0 an input port
     MOV TH0,#-92    ;TH- = A4H FOR -92
```

```
        MOV IE,#82H          ;IE = 10000010(bin) enable Timer 0
        SETB TR0             ;Start Timer 0

    BACK:MOV A,P0                ;get data from p0
        MOV P1,A             ;issue it to p1
        SJMP BACK                ;keep doing it

       END
```

REF:

https://microcontrollerslab.com/8051-timer-generate-delay/

http://galia.fc.uaslp.mx/~cantocar/microcontroladores/TUTORIAL_8051/TIMERS.HTM