MICROCONTROLLERS AND MICROPROCESSORS

Assignment 4

Timer Programming

Mis : 111909002

Name: Abhijeet Deshmukh

[GitHub Repository for entire assignment with code, proteus files, hex files.](https://github.com/Sarabhian/Microcontroller_Lab)

# Q1 Write a program to generate 50Hz square wave on P1^0 pin of 8051 based microcontroller. Use timer in polling mode to generate delay.

## code

#include <SST89X5XXRD2.H>

// in this code we are going to create a square wave of 50HZ using timer

// declaring pin variables

sbit SW = P2^0;

// pre-defining functions

void delay(void);

// main function

void main()

{

SW = 0; // set initial pulse to 0

while(1)

{

SW = 1;

delay(); // generate delay

SW = 0;

delay();

}

}

// functions

//1. delay function using timer

/\* we want to create 50Hz square wave means 0.02second time for one cycle , means 0.01 second for on time = 10ms= 10,000 micro sec,

now, 10k mus = N x 1.085mus , --> N= round(9216.58 ) = 9217 ,

65536-9217=56319 == DBFF \*/

void delay(void)

{

TMOD = 0x01; // timer 0 mode 1

TH0 = 0xDB; // delay of 25ms

TL0 = 0xFF;

TR0 = 1; // start the timer

while(TF0==0); // we use polling method

TR0 = 0;

TF0 = 0;

}

## Simulation

Text

Description automatically generated

# Q2. Design a BCD counter which increments every one-second starting from 00 up to 99. When it reaches 99 it should stop. Use timer in polling mode to generate one-second delay.

## code

#include <SST89X5XXRD2.H>

// in this program we will create a bcd counter and increase it's count by 1sec using timer.

// declaring pins

// declaring variables

unsigned char i,a, lsb ,msb ;

// pre declaring functions

int deci2bcd(unsigned int );

void Timer\_delay(void);

//main function

void main ()

{

for( i=0 ; i< 100 ; i++)

{

P1=deci2bcd(i);

Timer\_delay();

}

}

//functions

//1. deci2bcd convertor

int deci2bcd(unsigned int A) // decimal must be 2 digit or less

{

lsb = A%10 ; // finds unit place

msb= A/10 ; // finds tens place

msb=(msb<<4) ;

a= msb+lsb;

return a ;

}

//2. Time delay of 1s

void Timer\_delay()

{

// to create delay of '1 sec' timer will delay 50ms for 20 times , 50ms/1.085= 1843 counts => 65536-1843= 63693

unsigned char count=0;

while (count!=20)

{

TMOD=0x01;

TL0=0xFD;

TH0=0x4B;

TR0 = 1; // Start Timer

while(TF0 == 0); // Polling for flag bit

TR0 = 0; // Stop Timer

TF0 = 0;

count++;

}

}

## simulation

Text

Description automatically generated

# Q3 . Measure the frequency of the IC 555 oscillator and display it on the 16x2 LCD. (counter mode of operation).

## code

#include <SST89X5XXRD2.H>

// this code counts frequency in Hz

// pin configurations

#define LCDPORT P2 // declaring p1 as LCDPORT ( assigning newe variable )

sbit RS = P1^0;

sbit RW= P1^1;

sbit E= P1^2;

sbit t1= P3^5 ;

// initializing variables

unsigned char e[]={"FrequencyCounter"};

unsigned char f[]={"Freqz :"};

unsigned char h[]={"Hz"};

unsigned char coln[] = {":"};

unsigned char k , t, d0 ,s1,s2,s3,s4,d1, d2, d3, d4 ,d5,d6,pulses ;

// function declarations

void LCD\_data( unsigned char );

void LCD\_cmd(unsigned char);

void enable(void);

void LCD\_init(void);

void delay(unsigned int );

int hex2deci(unsigned char);

// main function

void main()

{

t=0;

TMOD=0x51; // mode 1 couter 1 timer 0 0101 0001

while(1)

{

t1=1;

TH1=0; // counter initialize

TL1=0;

TR1=1; // counter start

delay(100); // 100 milisecond delay

TR1=0;

t= TL1 + TH1\*256; // TH1 = 0XFF , TL1=0XFA , T= FFFA

t=t\*10;

// no of pulse counts in 100ms time

d0=t%10; // 6547%10 = 7

d1=(t/10)%10; // 6547/10 = 654 %10 = 4

d2=(t/100)%10; //

d3=(t/1000)%10;

d4=t/10000;

LCD\_init();

LCD\_cmd(0x80);

for(k=0;k<=15;k++)

{

LCD\_data(e[k]);

}

LCD\_cmd(0xc0);

for(k=0;k<=6;k++)

{

LCD\_data(f[k]);

}

LCD\_data( d4 +48);

LCD\_data( d3 +48);

LCD\_data( d2 +0x30);

LCD\_data( d1 +0x30);

LCD\_data( d0 +0x30);

for(k=0;k<=2 ;k++)

{

LCD\_data(h[k]);

}

delay(3000);

}

}

// 1. timer delay function \*\*\*\*\*\* // IMPORTANT // \*\*\*\*\*\*\*

void delay(unsigned char i) // creates delay in milisecond

{

unsigned char j;

for(j=0;j < i ;j++) // each iteration creates 1 milisecond of delay. --> 'i' iterations i mili sec delay.

{

// need one 1ms delay => 1ms/1.085mus = 922 counts --> 65536-922= 64614 -->converting in hex ---> Timer initial value = FC66 --> TH0=FC ,TL0=66.

TH0=0xFC;

TL0=0x66;

TR0=1;

while(!TF0);

TF0=0;

TR0=0;

}

}

// 2. LCD\_init functon ... used for initializing LCD commands

void LCD\_init(void)

{

LCD\_cmd(0x38); //5x7 matrix of cursor

LCD\_cmd(0x0E); // cursor blinking ON

LCD\_cmd(0x06); // cursor Auto increament to right

LCD\_cmd(0x01); // clrear screen

}

// 3. LCD\_data ... data mode --> RS=1 , LCD is currently output device so R/W= 0 (i.e. here RW=0)

void LCD\_data(unsigned char value)

{

RS=1; RW=0;

LCDPORT= value;

enable();

delay(5);

}

// 4. LCD\_cmd ... command mode --> RS=0 , RW=0

void LCD\_cmd(unsigned char command )

{

RS=0;RW=0;

LCDPORT=command;

enable();

delay(5);

}

//5. enable ... used to generste pulse

void enable(void)

{

E=0;E=1;E=0;

}

## simulation

Text

Description automatically generated