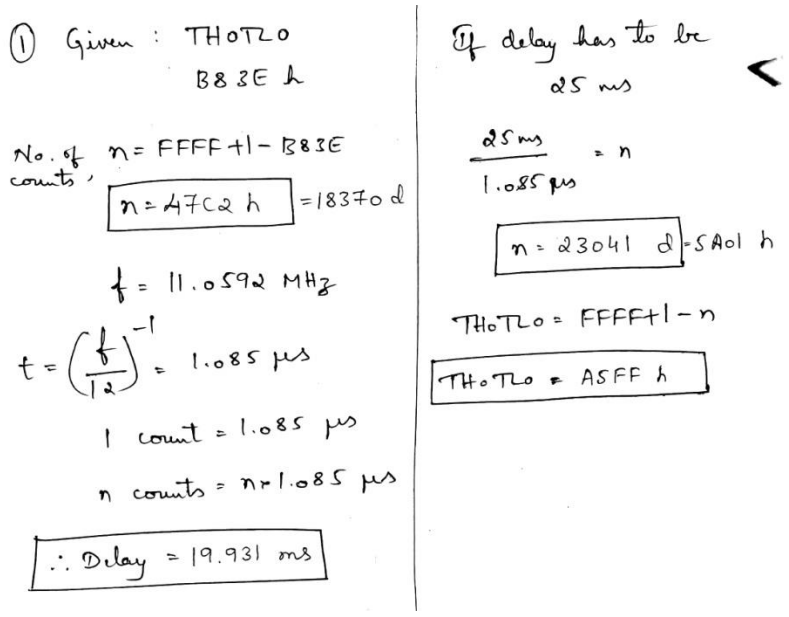
MICROCONTROLLER

Internal Assesment Test – II

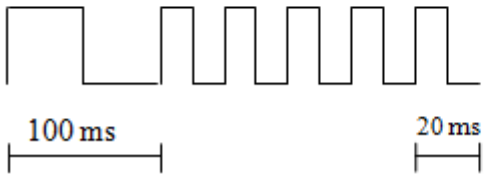
1. Find the delay generated by timer 0 in the following code. Calculate the delay generated. What count has to be loaded in TL0 and TH0 if delay has to be increased to 25ms?

```
        CLR P2.3
HERE: MOV TMOD, #01
        MOV TL0, #3E h
        MOV TH0, #0B8h
        SETB P2.3
        SETB TR0
AGAIN: JNB TF0, AGAIN
        CLR TF0
        CLR TR0
        CLR P2.3
```

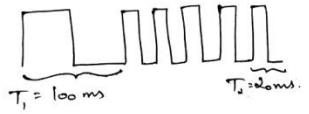


2.

Using P1.5, timer - 1 in mode – 1, write a program to generate the following waveform as shown below. Assume that the system clock is 11.0592 MHz. Show the delay calculations. This waveform should be generated continuously.



(2). Given : Waveform generation at P1.5 using Timer 1 in mode 1.



For Square wave of duration 100 ms.

$T = 100\,ms$

$t = \frac{100\,ms}{2} = 50\,ms$

$1.085\,\mu s$ = 1 count

$50\,ms = ?(n) = 46082\ d = B402$

TH1TL1 = FFFF+1-n,

TH1TL1 = 4BFE h

For square wave of duration 20 ms

$T_2 = 20\,ms$

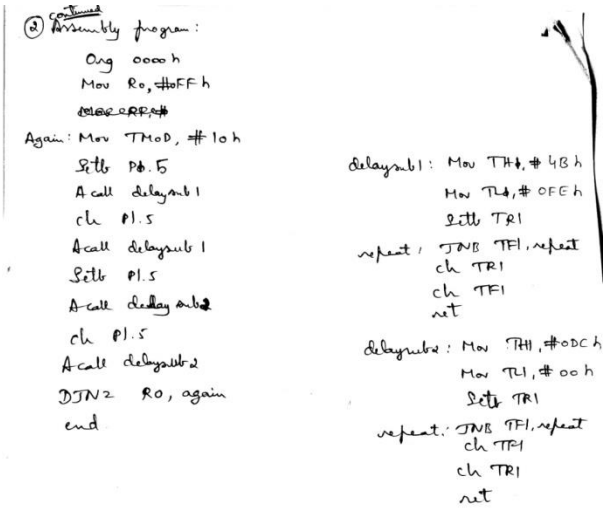
$t_2 = \frac{20\,ms}{2} = 10\,ms$

$1.085\,\mu s$ = 1 count

$10\,ms = ?(n_2) = 9216\ d = 2400\ h$

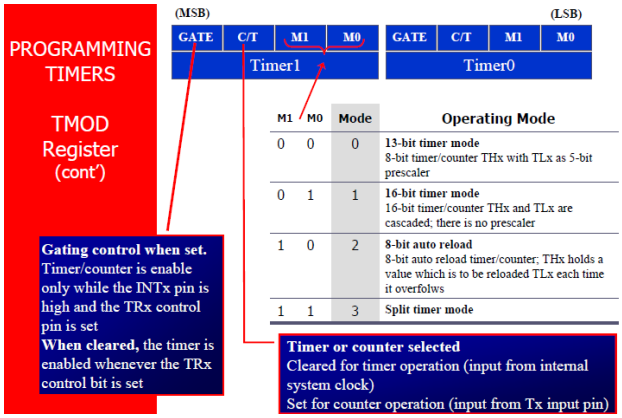
TH1TL1 = FFFF+1-n2

TH1TL1 = DC00 h

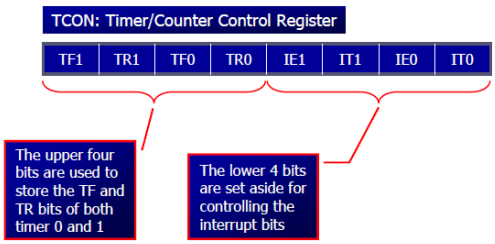


```
② Assembly program:
        Org  0000 h
        Mov  R0, #0FF h
Again:  Mov  TMOD, #10 h
        Setb P1.5
        Acall delaysub1
        clr  P1.5
        Acall delaysub1
        Setb P1.5
        Acall delaysub2
        clr  P1.5
        Acall delaysub2
        DJNZ R0, again
        end

delaysub1: Mov TH1, #4B h
           Mov TL1, #0FE h
           Setb TR1
repeat:    JNB TF1, repeat
           clr TR1
           clr TF1
           ret

delaysub2: Mov TH1, #0DC h
           Mov TL1, #00 h
           Setb TR1
repeat:    JNB TF1, repeat
           clr TR1
           clr TR1
           ret
```

3. Explain TCON and TMOD registers with its bit pattern.



- TCON (timer control) register is an 8-bit register



4. Write an 8051 software time delay subroutine to generate a time delay of 100

µs when called. Assume crystal frequency as 12 MHz. Show delay calculations. Do not use timers.

④ Given $f = 12$ MHz

$t = \left(\frac{f}{12}\right)^{-1} = 1\ \mu s$

1 count = 1 μs

? = 100 μs

$\frac{100\ \mu s}{1\ \mu s} = 100_d = 64\ h$

```
Delay subroutine : Mov R0, #64h
repeat :           DJNZ R0, repeat
                   Ret
```

5. Assume that a 1 Hz frequency pulse is connected to pin P3.4. Write an 8051 C program to display counter 1 on an LCD. Set the initial value to get one minute delay.

5. Given : External clock pulse of 1 Hz to pin 3.4.

$\therefore C/\overline{T} = 1$

TMOD : G $C/\overline{T}$ M1 M0 G $C/\overline{T}$ M1 M0

0 0 0 0 0 1 0 1 = 05 h

TMOD = 05 h

Delay = 1 minute = 60 s

f = 11.0592 MHz

$t = \left(\frac{11.0592\ MHz}{12}\right)^{-1}$

$t = 1.085\ \mu s$

1.085 μs = 1 count

60 s = ?

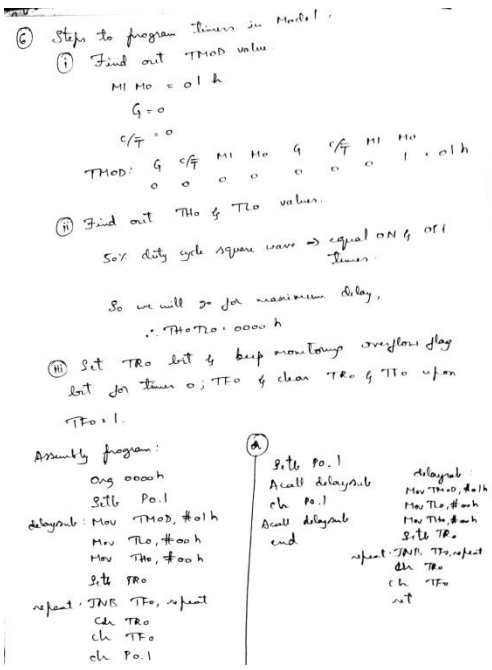
$n = 55299539_d$

$n = 34BCDD3\ h$

Let LCD be connected to P0.

```
#include <reg51.h>
sbit port3_4 = P3^4;
void delayfunc();
void main()
{
while (1)
{
unsigned int i;
P0 = 0x00;
Port3_4 = 1;
TMOD = 0x05;
TH0 = 0x00;
TL0 = 0x00;
for (i=0; i<843; i++)
{
TR0 = 1;
while (TF==0);
clr TF0;
clr TR0;
}
}
}
```

6. Explain the steps to program timers in mode 1 and write an 8051 program to generate a square wave of 50% duty cycle on pin 1.5.



7. Generate square wave of 5 KHz and 10 KHz on P1.2 and P1.3 continuously using timer 1 and timer 0 in mode 2 for the same.

(7) Given: Square wave of 5kHz & 10 kHz to be generated on P1.2 & P1.3 respectively using timer 1 & 0 in mode 2.

$f_1 = 5$ kHz

$t_1 = \left(\frac{1}{5k}\right)/2$

$t_1 = 0.1$ ms

$f_2 = 10$ kHz

$t_2 = \left(\frac{1}{10k}\right)/2$

$t_2 = 0.05$ ms

1.085 μs = 1 count

t_1 = ?

$n_1 = 92.165\ d = 5C\ h$

1.085 μs = 1 count

t_2 = ?

$n_2 = 46.082\ d = 2E\ h$

TH1 = FF+1−n1

TH1 = A4 h

TH0 = FF+1−n2

TH0 = D2 h

Assembly program:

```
Org 0000h
Setb P1.2
Setb P1.3
Acall delay1
delay1: Mov TH0D, #D2h
Mov TH1, #A4h
Setb TR1
repeat: JNB TF1, repeat
clr TF1
clr TR1
ret
clr P1.2
Acall delay1
Mov TH0D, #D2h
Acall delay2
clr P1.3
Acall delay2
end
delay2:
Mov TH0, #D2h
Setb TR0
repeat: JNB TF0, repeat
clr TF0
clr TR0
ret
```