

# Embedded System :Assignment#5

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**Info:** Gregorian calendar before January 1st, 1900 is not supported.

## 1 Problem 1

- Write a perpetual calendar clock using an interrupt service routine, which should start counting from a set time, and store the counting results (year, month, day, hour, minute, second) in an array in RAM.

Answer

Code as follows:

```
1  #include <reg51.h>
2
3  unsigned int sec_50ms = 0;
4  unsigned int sec = 0, min = 59, hour = 23, day = 28, month = 2, year = 2004;
5
6  unsigned int days_in_month[12] = {31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31};
7
8  void Time0Isr(void) interrupt 1
9  {
10     TH0 = 0x3c;
11     TLO = 0xb0;
12
13     if (sec_50ms == 20)
14     {
15         sec_50ms = 0;
16         sec++;
17
18         if (sec == 60)
19         {
20             sec = 0;
21             min++;
22
23             if (min == 60)
24             {
25                 min = 0;
26                 hour++;
27
28                 if (hour == 24)
29                 {
30                     hour = 0;
31                     day++;
32
33                     if ( day == days_in_month[month] + 1 )
34                     {
35                         day = 1;
```

```

36     month++;
37     if ( month == 13 )
38     {
39         month = 1;
40         year++;
41         if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0))
42         {
43             days_in_month[1] = 29;
44         }
45         else
46         {
47             days_in_month[1] = 28;
48         }
49     }
50 }
51 }
52 }
53 }
54 }
55
56     sec_50ms++;
57 }
58
59 void main()
60 {
61     TMOD = 0x01;
62     TH0 = 0x3c;
63     TL0 = 0xb0;
64     ET0 = 1;
65     EA = 1;
66     TR0 = 1;
67
68     while (1);
69 }

```

### Answer

Running perfectly synchronized with the real time,

Name	Value	Type
sec	0x000E	uint
min	0x0003	uint
day	0x001C	uint
month	0x0002	uint
year	0x07D4	uint

Simulation t1: 194.52299200 sec

( 194 sec = 3 min + 14 sec = 3:E )

With  $60 \times 60 \times 24$  times (one second per day) result started from 2004-2-28 00:00:00,

Name	Value	Type
day	0x0003	uint
month	0x0002	uint
year	0x07D7	uint
<Enter expression>		

Simulation t1: 1071.10563500 sec

after 1071 days, the result is exactly 2007-2-3 00:00:00.