

CS13002 Programming and Data Structures, Spring 2006

Lab test 1

Total points: 20

February 07, 2006

Time: 13:30–16:00

For students with odd PC numbers

Time is specified in the standard format **dd-mm-yyyy hh:mm:ss**. Here **dd** is a 2-digit representation of the date. A one-digit date (1 through 9) needs to be preceded by a 0. Similarly, for the month **mm** (an integer in the range 01–12), the hour **hh** (00–23), the minute **mm** (00–59) and the second **ss** (00–59). Some valid examples are: **07-02-2006 13:39:02** and **29-02-2000 00:59:59**. Some invalid examples are: **31-04-2007 00:59:59** (invalid date), **07-02-2006 25-59-73** (invalid time).

In computers, time is often represented more compactly. For example, the Unix™ operating system represents system time by a 32-bit *signed* integer. It stores the number of seconds from the *epoch* which is **01-01-1970 00:00:00** (12 midnight of Jan 01, 1970). Positive values imply times after the epoch and negative values stand for times before the epoch. For this test, you are asked to investigate positive times only (though you represent time by a 32-bit *signed* integer).

Write a program to do the following. Scan a time in the prescribed format (**dd-mm-yyyy hh:mm:ss**). First check whether it represents a valid time (on or) after the epoch. If so, convert this time to the number of seconds after the epoch. For doing that, first compute the number of days elapsed after the epoch. This number equals $(\text{yyyy} - 1970) \times 365 + l + d$, where l is the number of leap years after the epoch and before the supplied time (the year 2000 was a leap year), and d is the contribution due to the date and month fields. Each day has 86400 seconds. Convert the number of days to number of seconds. Finally, add the contribution of the day's time **hh:mm:ss**, and print the calculated number of seconds as a signed integer.

Sample output

```
Enter time (dd-mm-yyyy hh:mm:ss) : 07-02-2006 13:39:02
Number of days from 01-01-1970          is 13186
Number of seconds from 01-01-1970 00:00:00 is 1139319542

Enter time (dd-mm-yyyy hh:mm:ss) : 13-02-2009 23:31:30
Number of days from 01-01-1970          is 14288
Number of seconds from 01-01-1970 00:00:00 is 1234567890

Enter time (dd-mm-yyyy hh:mm:ss) : 31-04-2007 00:59:59
Invalid date

Enter time (dd-mm-yyyy hh:mm:ss) : 07-12-2006 25-59-73
Invalid hour
```

Test input

Submit the output of your program for the following ten time values:

```
01-01-1970 00:00:00 /* The epoch */
29-02-1984 23:59:59
01-03-1984 00:00:00
09-09-2001 01:46:40
28-02-2006 12:34:56
29-02-2006 54:32:10
31-12-2010 23:59:59
01-01-2011 00:00:00
19-01-2038 03:14:07 /* The largest representable time*/
19-01-2038 03:14:08 /* Overflow occurs in the counter*/
```