

COE 205 Computer Organization & Assembly Language – Spring 2008

Programming Assignment 3

Displaying the Date and Prime Number Generation

- Q1.** (12 pts) Write an assembly language program to read a 4-digit hexadecimal number from the user, representing a **date stamp** and output the corresponding date in a readable format. The format of the date stamp is as follows:

0 0 1 1 0 0 1 1 1 0 0 0 0 0 1 1
└──────────┬──────────┬──────────┘
 year month day

The least significant 5 bits represent the day number, the next 4 bits represent the month number, and the most significant 7 bits represent the year number relative to 1980. Thus, the above day number is 3, the month number is 12 (December), and the year number is $25 + 1980 = 2005$. The above date should be displayed as 3-DEC-2005. Here is a sample run:

```
Enter date stamp as 4 hex digits: 3383
Date is: 3-DEC-2005
Repeat program (Y/N)? n
```

Read the input character by character as in the first question and filter the keyboard so that it does not accept an invalid character as input. Validate the day number and the month number after reading them. Day 0 and months 0, 13, 14, and 15 should not be accepted, and an error message: **INVALID DATE** should be displayed. The following month names should be used (JAN=1, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC=12).

Check whether the day number is out of range for a given month. For example, there are exactly 30 days in April (month 4), so April 31 is not allowed. Similarly, you can't have more than 29 days in February (month 2), so February 30 and 31 are not allowed. The month of February is typically 28 days, but can be 29 days in a leap year. A leap year is a year divisible by 4, so 1980 is a leap year, but 1981 is not. So, February 29, 1980 is allowed, but February 29, 1981 is NOT allowed. Check whether the day number is out of range for February.

Bonus = 2 pts (Compute the weekday from the date)

1-JAN-1980 is a Tuesday and can be displayed as TUE 1-JAN-1980. Given a valid date, compute and display the weekday from the date. Here, you need to compute the number of days since 1-JAN-1980 and then divide this number by 7 and use the remainder to compute the weekday. If done properly, you should get Saturday for 3-DEC-2005.

- Q2.** (8 pts) Write an assembly language program to compute and print the first n prime numbers. A number x is prime if no number except 1 and x divides it evenly. A sample run should look as follows. Limit the input n to a maximum of 10,000 prime numbers.

```
How many Prime Numbers: 10
Generated Prime Numbers:
2, 3, 5, 7, 11, 13, 17, 19, 23, 29
```

Store the generated prime numbers in an array before displaying them. To test if an integer x is prime, divide x by the prime numbers that were discovered and stored in the array.