



Department of Electrical and Computing Engineering

UNIVERSITY OF CONNECTICUT

ECE 3411 Microprocessor Application Lab: Fall 2015

Lab Test I

There are 3 longer programming problems in this test. There are 5 pages in this booklet. Answer each question according to the instructions given.

You have **100 minutes** to answer the questions. Once you are done, you need to show the output to the Instructor or TA and e-mail the code to the TA.

Some questions are harder than others and some questions earn more points than others—you may want to skim all questions before starting.

If you find a question ambiguous, be sure to write down any assumptions you make.

Be neat and legible. If we can't understand your answer, we can't give you credit!

Write your name in the space below. Write your initials at the bottom of each page.

THIS IS AN OPEN BOOK, OPEN NOTES TEST.

YOU CAN USE YOUR LAPTOP BUT PLEASE TURN YOUR NETWORK DEVICES OFF.

Any form of communication with other students is considered cheating and will merit an F as final grade in the course.

Do not write in the boxes below

1 (x/15)	2 (x/35)	3 (x/50)	Total (xx/100)

Name:

Student ID:

1. [15 points]: Write the C code for the following function which returns a random bit ('1' or '0') with 75% probability for '1' and 25% probability for '0'.

Hint: You may use `rand()` to generate a random integer. This function returns an integer value between 0 and `RAND_MAX`, where $\text{RAND_MAX} = 32763 = 2^{15} - 1$

```
int get_rand_bit()
{
    int bit;
```

```
    return bit;
}
```

Initials:

2. [35 points]: The Fibonacci sequence is the series of numbers:

$$\begin{aligned}F_0 &= 0, \\F_1 &= 1, \\F_2 &= 1, \\F_3 &= 2, \\F_4 &= 3, \\F_5 &= 5, \\F_6 &= 8, \\F_7 &= 13, \\F_8 &= 21, \dots,\end{aligned}$$

where each number in the sequence is the sum of the previous two numbers.

- a. Write a C code which takes a *non-negative* integer n as input from the user, and returns the index i of the first element of the Fibonacci sequence which exceeds the given number n , i.e., $F_i > n$.
- b. Run your code on inputs $n = 1000$ and $n = 10000$ and write down the indices as computed by your code.

Initials:

3. [50 points]:

a. Write a C program that takes an email address as input (character by character) and verifies that:

- It contains one and only one at sign @
- It contains at least one period . which succeeds the @ sign
- The special characters @ and . cannot be consecutive, i.e. @., @@, ..., and .@ are invalid

For example

- alice@engr..edu is considered invalid
- alice@mydomain.co.uk is considered valid
- alice@engr@.uconn.edu is considered invalid

b. Below, draw the finite state machine diagram used in your code.

Initials:

End of Quiz

Please double check that you wrote your name on the front of the quiz.

Initials: