

EECE 230 Introduction to Programming, Sections 3 and 4

Quiz I

Nov 14, 2011

- The duration of this exam is 2 hours and 40 minutes.
- It consists of 3 problems.
- The exam is open book. You can use also all the material on Moodle: lecture notes, programming assignments, and solutions, etc. You are **NOT** allowed to use the **web** (**imail** included). You are not allowed to use **USB's** or files previously stored in your **account**.
- If you violate the above rules or if you communicate with a person other than the exam proctors during the exam, you will immediately get zero and you will be referred to the appropriate disciplinary committee.
- Active cell phones and any other unauthorized electronic devices are absolutely not allowed in the exam rooms. They should be turned off and put away.
- Plan your time wisely. Do not spend too much time on any one problem. Read through all of them first and attack them in the order that allows you to make the most progress.
- Submit your solutions each part in a separate file as indicated in the booklet. Include your name and ID number in each file. Submit the files online in a single zip file called *yourLastName.yourFirstName.zip*.
- Good luck!

Problem 1 (25 points). Factorial

If n is a positive integer, the factorial of n , denoted by $n!$, is defined as the product of all the positive integers less than or equal to n , i.e.,

$$n! = 1 \times 2 \times \dots \times (n - 1) \times n$$

If the integer n is zero, we define $n!$ to be 1, i.e., $0! = 1$. Example:

$$\begin{aligned} 0! &= 1 \\ 1! &= 1 \\ 2! &= 1 \times 2 = 2 \\ 3! &= 1 \times 2 \times 3 = 6 \\ 4! &= 1 \times 2 \times 3 \times 4 = 24 \end{aligned}$$

Write a program which prompts the user to enter a nonnegative integer n . If $n > 0$, your program is supposed to find $n!$. If n is negative, your program is supposed also to display the error message “input negative”.

You are NOT allowed to use any function defined in the header-file *cmath*.

You can assume that the user input n is at most 16 (for $n \geq 17$, you will get wrong answers since the the magnitude of $n!$ is larger than the capacity of the integer type).

Problem 2 (30 points). Two contiguous consecutive integers

Write a program which prompts the user to enter a list of integers whose end is the indicated by the sentinel -999. Your program is supposed to check whether or not the the list contains two contiguous integers which are consecutive(i.e., whether or not x followed by $x + 1$ appear in the list for some integer x).

Examples: Each of the following lists contain two contiguous integers which are consecutive (underlined)

- 30, 10, 11, 7, -999
- 10, 11, -999

None of the lists below contain two contiguous integers which are consecutive

- 30, 10, 12, 7
- 10, -999
- -999

Your program is supposed to give a YES/NO answer only.

Any correct solution of this problem is worth 25/30 points. To get full grade you are supposed to solve it without using arrays.

Submit your solution in a file called Prob2.cpp including your name and ID number.

Problem 3 (30 points). Element distinctness problem

Write a program which prompts the user to enter an integer n , and list of n integers. Your program is supposed to check whether or not all the n integers in the list are distinct.

For instance, the list 30, 7, 9, 7, 10 does not consist of distinct integers since 7 appears twice.

Your program is supposed to give a YES/NO answer only.

Submit your solution in a file called Prob3.cpp including your name and ID number.

Problem 4 (15 points). Merging two sorted lists

Write a program which prompts the user to enter two lists of sorted integers. Assume that the end of each list is the indicated by the sentinel -999. Assume that the integers in each list are sorted in nondecreasing order. Your program is supposed to merge the two sorted lists into a single list sorted in nondecreasing order.

Examples:

- If $List1 = \langle 3, 5, 24, 56, -999 \rangle$ and $List2 = \langle 2, 10, 13, 14, 29, 100, 101, -999 \rangle$.

Then your program should output: 2, 3, 5, 10, 13, 14, 24, 29, 56, 100, 101.

- If $List1 = \langle 5, 16, 27, -999 \rangle$ and $List2 = \langle 3, 5 \rangle$.

Then your program should output: 3, 5, 5, 16, 27.

Note that your program is NOT supposed to work correctly if the input lists are not sorted in nondecreasing order (e.g., if $List1 = \langle 16, 5, 27, -999 \rangle$ and $List2 = \langle 3, 5 \rangle$).

To get full grade you are supposed to solve the problem without nested loops. A solution of this problem based on nested loops is worth 5/15.

Submit your solution in a file called Prob4.cpp including your name and ID number.