

# COL 100 Minor 2 Exam

October 4, 2018. 8:00 am - 9:00 am

**Name:**

**Entry Number:**

**Group:**

**Notes:**

- Total number of questions: 4. Max Marks: 20
- All answers should be written on the question paper itself.
- The last two sheets in the question paper are meant for rough work. If you run out of space, you can answer questions in this rough space. However, please clearly mention in the answer space for the appropriate question that we should look at the rough space for its answer.
- We will collect the question paper (including the last two sheets meant for rough work). We will not be collecting back any other rough sheets.

1. Write a function *countDigits(string str)* which inputs a string and counts the number of (1) digits (2) lower case letters from English alphabet (3) uppercase letters from English alphabet in the string. For example, if your input string is "COL100-Minor2Exam" then your program should output:

```
number of digits: 4  
number of lowercase letters: 7  
number of uppercase letters: 5
```

You can make use of the following functions: *isdigit(char ch)* returns true if input character *ch* is a digit false otherwise. *islower(char ch)*: returns true if the input character *ch* is a lower case letter, false otherwise. *isupper(char ch)*: returns true if the input character *ch* is upper case letter, false otherwise. [5 marks]

(Extra space for answering Q1)

2. Let  $A$  be an  $m \times n$  matrix of integers. Frobenius norm of the matrix  $A$  is the sum of the squares of each of its elements. In other words,  $\|A\|_F = \sum_{i,j=1,1}^{i,j=m,n} A_{ij} * A_{ij}$ , where  $\|A\|_F$  denotes the Frobenius norm and  $A_{ij}$  denotes the  $ij^{th}$  element of  $A$ . Write a function `getFrobeniusNorm(Grid<int> A)` which inputs a matrix  $A$  represented as a grid, and returns the Frobenius norm of  $A$ . [4 marks]

(Extra space for answering Q2)

3. We say that a Vector of integers is sorted in ascending order if all of the element at position  $i$  is always less than equal to the element at position  $i + 1$  for all possible values of  $i$ . For example, Vector  $\{1, 4, 5, 7, 7, 11\}$  is Vector sorted in ascending order. Similarly, Vector  $\{2, 4, 8, 10\}$  is also sorted. Given two sorted vectors  $v1$  and  $v2$ , we say that  $v3$  is corresponding merged vector if (a)  $v3$  contains exactly the elements present in both  $v1$  and  $v2$  (with duplicates repeated as many times as in original vectors) (b) the sorted order of the original vectors is maintained. In other words, each element of  $v3$  is either an element of  $v1$  or  $v2$  such that  $v3$  is still sorted. For the example above, the merged vector  $v3$  would be  $\{1, 2, 4, 4, 5, 7, 7, 8, 10, 11\}$ . Write a function `merge(Vector<int> v1, Vector<int> v2)` which inputs two sorted Vectors  $v1$  and  $v2$  and returns the resultant of merging the elements of  $v1$  and  $v2$ . Your program should run in  $O(m + n)$  time where  $m$  and  $n$  are sizes of the two vectors. [6 marks]

(Extra space for answering Q3)

4. Suppose you are working with an application which needs to write the contents of a file to another file but only the even numbered lines should be copied. Write a program which inputs a string from the user: *filename*, creates an input stream over file named *filename*, reads the contents of this file, and selectively writes the even numbered lines to another file named "out.txt". Note that you will have to create an output stream over "out.txt". Also, do not forget to close the files at the end of the operation. For example, if the file has the following content:

```
col100 is going well.  
some more practice will help.  
it is good to know so many students are doing col100.  
I hope the Minor 2 goes well for everyone.
```

Then your output file should contain the following lines:

```
some more practice will help.  
I hope the Minor 2 goes well for everyone.
```

[5 marks].



Rough page 1

Rough page 2