COE 301 Introduction to Computer Programming Fall, 2019

Homework 8 – Due: 11/01/2019 9:00 am

Problem 1. (40 points) Short answers.

(1) [7 points] what will the following code output?

```
#include <iostream>
#include <vector>
using namespace std;

int main(){

  vector<int> x;

  cout << x.size() <<endl;

  for(int i=0; i<5; i++){
    x.push_back(i);
  }

  for( int i=0; i<x.size(); i++){
    cout << x[i] <<" ";
  }
  cout << endl;
  cout << x.size() <<endl;

  return 0;

}
```

(2) [3 points] explain why the following code segment leads to memory leak?

```
int *ptr;
for(int i = 0; i < 100; i++){
     ptr = new int[5];
}
delete[] ptr;
```

(3) [5 points] Explain what this function computes.

```
     #include <vector>
     #include <limits>
     using namespace std;
     int func(vector<int> &x){

        int ret = numeric_limits<int>::max();
        for( int i=0; i<x.size(); i++ ) {
            if( x[i] < ret ) {
                ret = x[i];
            }
        }
        return ret;
}
```

(4) [5 points] what is the output of the following C++ code?

```
#include <iostream>
#include <vector>
using namespace std;

int main() {
  int n = 4;
  vector<int> x(n, 5);

  for(int i = 0; i < n; i++){
     cout << x[i] << endl;
  }
  cout << "The length of x: " << x.size() << endl;

  return 0;

}
```

(5) [5 points] We want to use the following code to print all the elements in a **C-array**. Identify the error in the code and fix it.

```
#include <iostream>
using namespace std;

int main() {

  int x[7] = {3, 5, -1, 9, -3, 2, 8};

  for( int i=1; i<=7; i++ ) {
    cout << " " << x[i];
  }
  cout << endl;

  return 0;

}
```

(6) [5 points] Explain what this function computes.

```
int myFunc(int n){
  // you can assume n >= 0

  if (n == 0 || n==1){
    return n;
  }else{
    return myFunc(n-1)+ myFunc(n-2);
  }
}
```

(7) [5 points] What is the output of the following code?

```
#include <iostream>
using namespace std;

int someFunc(int *arr, int size) {

   int  ret = 0;

   for (int i = 0; i < size; ++i) {
      ret += arr[i];
   }

   return ret;
}

int main () {

   int x[4] = {1, 2, 3, 4};

   cout << someFunc(x,4) << endl;

   return 0;
}
```

(8) [5 points] Explain what this function computes.

```
#include <cmath>
#include <vector>
using namespace std;

double func(vector<double> &x)
{
   double ret = 0;

   for( int i=0; i<x.size(); i++ ) {
       ret += x[i]*x[i];
   }

   return sqrt(ret);
}
```

Problem 2. (30 points) Write a C++ function

```
bool containsDuplicate (vector<int> &vecIn)
```

that takes an input vector of integers called vecIn returns true if any value appears at least twice in the vector and returns false if every element is distinct. For example, here are some return values for the given input:

vecIn	returns
{2, 1, 3, 1}	true
{1, 4, 3, 2}	false
{1, 1, 1, 2, 4, 4}	true
{}	false

Write a simple test program to call the function and demonstrate it works for the above cases.

Report your result in the write-up.
Please submit your .cpp file as "yourLastName_hw8_prob2.cpp".

Problem 3. (30 points) Write a C++ function

```
void matrixTranspose(vector<double> &m, int &nRows, int &nCols)
```

The C++ function `matrixTranspose` takes a vector `m` that represent a 2D matrix of nRows and nCols, computes its transpose and stores the result to the input vector `m`. The function should also swap the value of nRows and nCols. Note that the function return type is `void`. Write a simple test program to demonstrate it works.
Please see the definition of matrix transpose here:
https://en.wikipedia.org/wiki/Transpose

Report your result in the write-up.
Please submit your .cpp file as "yourLastName_hw8_prob3.cpp".

Submission Instructions:

There should be 3 files in your submission:

1. A write up (any type- .txt, .docx, .pdf are all fine) that contains your answers to all questions in problem 1-3.
2. The .cpp file for problem 2.
3. The .cpp file for problem 3.

Please make sure your last name is included in the filename.