COSC 1560 – Computer Programming II

Final Examination (Sample)

NAME:

Attempt all questions. The number of points for each question is shown. The total is 100 points.

[4 points]

1)

a) Declare an array of 3 elements of type char and initialize the array with ‘R’, ‘S’ and ‘T’.

b) Write a function to take the array as an argument and display each character, separated by a ‘,’.

c) Write a function to take the array as an argument and print out the alphabetically highest character.

.

[4 points]

2) The following function is an implementation of the 'selection sort' algorithm, and sorts the array of integers into ascending order:

```
void selectionSort(int array[], int size)
{
        int minIndex;
        int minValue;
        int temp;

        for (int start=0; start < (size-1); ++start)
        {
            minIndex = start;
            minValue = array[start];
            for (int index = start+1; index < size; ++index)
            {
                if (array[index] < minValue)
                {
                    minValue = array[index];
                    minIndex = index;
                }
            }
            temp = array[minIndex];
            array[minIndex] = array[start];
            array[start] = temp;
        }
}
```

a) What changes would have to be made if the requirement is to sort the array into descending order?

b) What changes would have to be made if the function was being written to sort an array of 'char' into ascending order?

[8 points]

3) The following is an array of 5 values of type double:

```
double values[] = {5.5, 6.6, 7.7, 1.1, 2.2};
```

Suppose that the memory locations of the array are: 1200, 1208, 1216, 1224, 1232.

Indicate the output of the following lines of code:

```
double* ptr = &values[1];
```

a) `cout << *(ptr+2) << endl;`

b) `cout << *ptr + 2 << endl;`

```
ptr++;
```

c) `cout << *(ptr - 2) << endl;`

d) `cout << ptr << endl;`

```
values[0] = *(ptr – 1) + *(ptr + 1);

ptr = ptr – 2;
```

e) `cout << *ptr << endl;`

[6 points]

4)

a) Explain the difference between an argument being passed to a function “by value” and “by reference”.

b) If a ‘string’ variable is required to be passed to a function ‘by value’, it would usually be passed as ‘const string& s’. Explain why this approach is taken when the intent is to pass by value.

[2 points]

5) The following function is designed to take an array of a particular size as an argument, dynamically create an array of the same size as the one passed as an argument, populate the newly created array with values that are double those in the array argument, and return a pointer to the newly created array.

```
int* doubleArray(const int numbers[], int size);
```

Explain why the array is specified as ‘const’.

[8 points]

6) Identify and correct any "compilation" or "programming" errors in the following code.

```
#include "iostream.h"

int total(double& d);   // Function to return the total of the values in the array

int main()
{
    int num

    int total

    double values[ ];

    cin << num;

    values = new double[num];

    for (int i==0; i > 10; ++i)
    {
        cin << values.i;

        cout << "Enter value.i: ";
    }

    f(values);

    cout << "Total: " << total << endl;

    return 1;
}

int total(double& d);
{
    double temp;
    for (int i = 0; i > num; ++i)
    {
        temp = d[num];
    }
    return temp;
}
```

[4 points]

7) Suppose the following character array is declared, and initialized:

```
char str[15] = "ABC101";
```

Give a brief explanation of the following function calls:

a) strlen(str)

b) tolower(str[1])

c) isupper(str[0])

d) isdigit(str[3])

[4 points]

8) Suppose the following character array is declared, and initialized:

```
char str[15] = "ABC101";
```

Provide code to meet the following requirements:

a) If str[2] is a lowercase character output "LOWERCASE", otherwise output "UPPERCASE"
b) Add "XYZ" to the end of the current content of 'str'.

[6 points]

9) Suppose that a string variable is declared and initialized as follows:

```
string str("ABC101");
```

Indicate the values that are output in the following lines of code:

a) `cout << str.at(2) << endl;`

b) `cout << str.size() << endl;`

c) `cout << str.back() << endl;`

d) `str.append("ABC");`

e) `cout << str << endl;`

f) `str.clear();`

g) `cout << str << endl;`

[8 points]

10) Declare a ‘struct’ called Employee to store the following information:

Name, of type string
Age, of type int
Department, of type string

a) Write a function to take an Employee as an argument, prompt the user to enter the necessary information for an Employee, and populate the argument.

b) Write a function to take an Employee as an argument and display, in a well-defined format, all information for an Employee.

c) Write three lines of code that could be used in a main function to declare an Employee variable, and call both of the two functions defined above.

[8 points]

11) *Note that in this question, the Employee structure, and any of the functions defined for an Employee in the previous question, can be utilized.*

Declare a 'struct' called Company to store the following information:

Name, of type string
Year Created, of type int
Employees, the exact number is not known

a) Write a function to take a Company as an argument, prompt the user for the name and year created of the company. Then prompt the user for the current number of Employees in the company, and allow the user to enter the information for each employee and be stored in the argument to the function.

b) Write a function to take a Company as an argument and display, in a well-defined format, all information in the Company.

[8 points]

12) Consider the following array:

```
const int SIZE = 5;
int numbers[SIZE] = {1,5,8,2,9};
```

a) Show how to open a TEXT file, called Data.txt, for writing.

b) Use a 'for' loop to write each value in the array 'numbers' to the file Data.txt, with each value being on a separate line.

c) Show how to open a TEXT file, called Data.txt, to "append" a value to the end of the current contents.

d) Write the following information to the file, following the current content, each on separate lines:

   i) The 'length' of the array.

   ii) The average, as type 'double', of the array elements.

   iii) The largest value in the array.

[8 points]

13) Consider the following structure:

```
struct Exam
{
        char name[20];
        int numStudents;
        int numQuestions;
};
```

Assume that the following array has been declared and populated by the user:

```
const int NUM_EXAMS = 10;

Exam tests[NUM_EXAMS];
```

Show how to complete the following tasks:

a) Open a file named “Exams.dat” as a binary file, for writing.

b) Write ‘NUM_EXAMS’ as the first value in the file.

c) Write the array ‘tests’ to the file.

[8 points]

14) Suppose we wish to randomly access certain elements of the binary file created in the previous question. Assume that the following variables have been declared:

```
int numExams;
Exam temp;
int location;
```

a) Open the file, as a binary file, for reading.

b) Read the first value in the file and store it in the variable 'numExams'.

c) Read the information associated with the first exam and store it in the variable 'temp'.

d) Read the information associated with the last exam and store it in the variable 'temp'.

e) Suppose the user enters an integer, between 0 and numExams-1, and it is stored in the variable named 'location'. Read the information associated with the value stored in the variable 'location' and store it in the variable 'temp' (if 'location is 0 then we should read the first Exam, if it is 1 then the second exam, etc.).

[8 points]

15) Declare a class named Dealer that is intended to store the following data related to a car dealership:

Name of dealership
Names of the most popular makes of car sold
(the number in this list may differ from one dealership to another)
Number of cars sold this year

The declaration of the class should contain the following functions:

Constructor – argument representing the name of the dealership
Destructor
Access and modifier functions for the name of the dealership, and the number of cars sold
A display function to display all information contained within the dealership
A populate function to enable the user to provide details of the dealership

[8 points]
16)

a) Provide a possible definition for the constructor function for the Dealership class in the previous question.

b) Provide a definition for the ‘populate’ function for the Dealership class in the previous question.