UNIVERSITY OF Waterloo

Examination Midterm Winter 2011 CS 246

Start:	2011-03-01 at 16:30
Exam ID:	2468650
Duration:	110 minutes
Sections:	CS 246 LEC 001,002
Instructors:	Holt Richard

Signature: ____________________

Instructions: (Read carefully before the exam begins):

1. Before you begin, make certain that you have one Exam Booklet.
2. **Additional Materials Allowed:** None
3. The marks assigned to each question are shown at the beginning of the question; use this information to organize your time effectively.
4. Place all your answers in the spaces provided on these pages.
5. You do not need to write comments in your code unless it is specifically required by the question.
6. Questions will not be interpreted. Proctors will only confirm or deny errors in the questions. If you consider the wording of a question to be ambiguous, state your assumptions clearly and proceed to answer the question to the best of your ability. You may not trivialize the problem in your assumptions.
7. Cheating is an academic offense. Your signature on this exam indicates that you understand and agree to the University's policies regarding cheating on exams.

Question	Marks Given	Out Of	Marker's Initials
1		9	
2		10	
3		14	
4		9	
5		13	
6		6	
7		8	
8		8	
Total		77	

QUESTION 1 [9 MARKS]

Q1a[1 mark] ____T/F After the following C++ statement is executed, the space for the value *p (the value pointed to by p) is in the heap.

```
  int * p = new int;
```

Q1b[1 mark] ____T/F The following C++ statements cause 26 to be printed.

```
  int i = 26; int * p = &i; *p = 27; cout << i;
```

Q1c[1 mark] ____T/F After the following C++ statements are executed, e has become a dangling pointer.

```
  double * d = new double (16.7); double * e = d; delete d;
```

Q1d[1 mark] ____T/F The following code causes 0 1 2 3 to be printed.

```
  int i = 0; while (i < 4); { cout << i; i++}
```

Q1e[3 mark] Re-write the following code so it uses a **while** loop (not a **do-while** loop) instead of a **for** loop.

```
for (int i = top; i >= target; i-=1)
    cout << i << endl;
```

Answer here:

Q1f[2 mark] What does the following code print?.

```
int n = 3;
switch (n){
case 1: case 2:
    cout << "Low";
    break;
case 3:
    cout << "Medium";
default:
    cout << "Unusual";
}
```

Answer here:

QUESTION 2 [10 MARKS]

Q2a [3 mark] ____ T/F The following code prints out 3.

```
void f (int a, int * b, int & c)
{ a = 1; *b = 2; c = 3; }
int main ( )
{ int i = 0; f(i,&i,i); cout << i; }
```

Q2b [3 mark] This code (see below) prints out which <u>one</u> of the following (check one).:

a. ___ 4 5
b. ___ 5 4
c. ___ 2 4
d. ___ 4 2
e. ___ 5 5

```
double a = 1, b = 2;
double & f (double & d) {
  d = 4;
  return b;
}
int main ( ) {
    f(a) = 5;
    cout << a << " " << b;
}
```

Q2c[2 mark] What does this command print?

```
$ echo ′whoami′
```

Answer here:

Q2d[2 mark] A file named myclass.h contains the interface for a class named myClass, shown below. This file needs to have a “guard” added to it so that if an attempt is made to include it (copy it) more than once in a compilation, then only one copy will actually be made. You are to add this guard into the above file (in the above box).

// Answer goes in this box:

```
class myClass {
public:
        //… public part …


private:
        //… private part …

};
```

QUESTION 3 [14 MARKS]

Q3a[5 mark] Write a C++ function named *totaleven* that accepts two parameters. The first is an array of integers. The second gives the array's dimension (the number of elements in the array). The function adds up all the even numbers in the array, while ignoring the odd numbers, and returns the value of the sum.

Answer here:

Q3b[1 mark] ____T/F The following code produces the output: 5

```
int a [] = {9, 11, 5};
cout << *(a+2);
```

Q3c[2 mark] ____T/F The following code produces the output: 18

```
int a = 6;
int b = 18;
cout << ((a > b) ? a : b);
```

Q3d[2 mark] Assume that in your current directory you have a file named `myfile.txt`. Write a shell command that makes sure that no users (except the owner of the file and except for the owner's group members) can modify the file.

Answer here:

Q3e[4 mark] Write a complete shell file named `getincl` that lists all lines in files in the current directory that contain the string:
`#include`

Answer here:

QUESTION 4 [9 MARKS]

Q4a[4 mark] Write a complete shell file named `getheader` that lists all files that are in the current directory (or in directories contains transitively in that directory) whose file name ends with `.h` (ends with a dot and then an h).

Answer here:

Q4b[5 mark] Write a C++ program that reads in tokens (white-space separated "words") from a file named `wordin.txt` until it encounters EOF (end of file). Your program should check to see if the file actually exists. Each word is to be output to the screen on a separate line.

Answer here:

QUESTION 5 [13 MARKS]

Q5a[9 mark] Some classes are scattered (or dependent), meaning part of the state of each of their objects is located outside of the object, typically in the heap. Scattered classes have a "big three" of related constructs that need to be considered, for example, to avoid memory leaks. These three deal with allocating and deallocating memory. List the name of each of these big three. Explain briefly when each of these is activated and what each accomplishes.

Answer here:

1)

2)

3)

Q5b[4 mark] Suppose you are writing a C++ program that has a variable D of type double. You are to give code (below) that will print D as dollars and cents in the following way. D is to be printed right-justified in field of width 7, with two digits to the right of the decimal point. (The decimal point should be printed.)

Answer here:

QUESTION 6 [6 mark] Many C++ programs start out with lines such as these two:

```
#include <iostream>
#include <string>
```

For the program, these two lines define a namespace called std. There are three methods to gain access to names in such a namespace. For each of these three, give the name of the method, along with an example of each and an explanation of each.

Answer here:

1)

2)

3)

QUESTION 7 [8 MARKS] The following program includes a class called Player. Each object of this type has a name and a number. You are to supply the missing overload for the = operator (the assignment operator).

```
#include <iostream>
using namespace std;
#include <cstring>
class Player
{
public:
    Player (const char startName[], int startNumber)
    {   int length = strlen(startName);
        number = startNumber;
        name = new char[length+1];
        strcpy (name, startName);
    }

    void output () { cout << name << " " << number; }

    Player & operator= (const Player &);
private:
    char * name;
    int number;
};
int main ( )
{   Player p("Bob", 13); Player q("Wayne", 99);
    p.output(); cout << endl; p = q; p.output(); cout << endl;
}
Player::Player & Player::operator=(const Player & rtSide)
```

```
// Your answer here --- write the implementation of overloaded = operator
```

QUESTION 8 [8 MARKS] You are to write a complete interface (a header file) named `time.h` for a class named Time. (You are not to write the implementation.) This class keeps track of the hour (1 to 12) and the minute (0 to 59). Your class should have a getter (accessor) and setter (mutator) for the hour and the minute. It should have hidden data to represent the hour and minute. It should have two constructors --- one which takes two parameters (the hour and the minute) and the other which takes one parameter (the hour, with a default of zero minutes). The interface should be written such that if it is included multiple times in a compilation, only one copy will be made. Overload the << operator to do output of time objects. Include appropriate comments in the interface.

Answer here.