Athlone Institute of Technology

School of Engineering

Semester 1 Examinations 2014

December Session

Bachelor of Science in Software Design (Game Development)

Year 3

Software Development for Gaming 3

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Internal Examiner(s): **Mr. John Barrett**

Instructions to candidates:

Read **all** questions carefully.

All questions carry equal marks.

Answer **Three** out of **Four** questions.

Time Allowed: 2 hours.

No. of pages including cover sheet: 5

Q.1. (a) Explain inheritance in relation to C++.

(2 Marks)

(b) In general if B::f is a function in the base class then a derived can take the actions below. Explain, using an example, each action:

- Extend B::f

(2 Marks)

- Replace B::f

(2 Marks)

- Inherit B::f

(2 Marks)

(c) Write a base class Worker and derived classes HourlyWorker and SalariedWorker. Each worker has a name and salary rate. Define a method computePay(int hours)in the base class Worker that can be overloaded by derived classes. computePay(int hours)computes the weekly pay for every worker. An hourly worker gets paid for the actual number of hours worked, if hours is at most 40. If the hourly worker worked more than 40 hours, the excess is paid at time and a half. The salaried worker gets paid the hourly wage for 40 hours, no matter what the actual number of hours is.

(9 Marks)

(d) Write a program that fills an array with 6 workers (a mixture of hourly and salaried workers) and computes their pay.

(3 Marks)

[20 Marks]

Q.2. (a) In C++ what is an activation record?

(2 Marks)

(b) Describe the contents of an activation record.

(4 Marks)

Question 2 continued on next page.

Q.2. (c) For the code segment below, show the contents of the run-time stack and value of each variable after:

- The factorial function has been called for the last time.

(6 Marks)

- The print function has been called.

(4 Marks)

```
void printResult(int value)
{
cout << "Final result is " << value << "\n";
}

int factorial(int a1)
{
   if (a1 <= 1)
      return 1;
   else
      return a1 * factorial(a1 - 1);
}

void main()
{
   int i = 4;
   int result = factorial(i);
   printResult(result);
}
```

(d) Explain, using an example, the role of the constructor and destructor of an object.

(4 Marks)

[20 Marks]

Q.3. (a) Compare the Standard Template Library list container and the Standard Template Library vector container in terms of efficiency when:

- Adding/Removing the element at the end of the container.

(4 Marks)

- Getting the kth element in the container.

(4 Marks)

(b) Bank of Europe has a customer base of over 100 million clients. Due to the large number of clients it needs to store client information in an appropriate data structure. A client has an account number and a name.

- Provide a class **Client** with which instances can be linked forward and backwards to other instances of **Client**.

(6 marks)

- Implement a method which removes an instance of **Client** from a linked list of clients.

(6 marks)

[20 Marks]

Q.4. (a) In relation to C++, describe operators and operands.

(2 Marks)

(b) Describe the function of operator overloading in C++? Provide an example of operator overloading in your answer.

(4 Marks)

(c) What does a C++ compiler do when it encounters a function template?

(2Marks)

(d) Write a function template which will find the largest of three variables of any type.

(3 Marks)

(e) Write a function template that will search in an array for a given element.

(4 Marks)

(f) Write a container class that can hold an object of any type. You should provide accessors and modifiers for the contained object.

(5 Marks)

[20 Marks]