Athlone Institute of Technology

School of Engineering

Semester 1 Examinations 2015

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) Describe the difference between Public, Private and Protected inheritance?

(3 Marks)

(c) Explain, using an example, Polymorphism in C++.

(5 Marks)

(d) Explain the difference between a statically bound function and a dynamically bound function.

(2 Marks)

(e) What is a pure virtual function?

(2 Marks)

(f) Implement a base class Entity. Derive classes PlayerEntity and AiEntity from Entity. An Entity has an id number, a position in 2d space and a current health. A PlayerEntity has a name and an AiEntity can be visible/invisible. Write the class definitions and the constructors for all classes. All data members of your classes should be private.

(6 Marks)

[20 Marks]

Q.2. (a) Memory in C++ is divided into four categories. List and describe each of the four categories.

(8 Marks)

(b) Describe the different named variables in the following program, and explain in what category of memory each variable resides. If the variable is a pointer detail what memory it points to.

```
static const int MAX_SIZE = 256;
bool initialiseArray(int* arrayParam, int sizeParam)
{
    if(size > MAX_SIZE)
    {
        return false;
    }

    for(int i=0; i<sizeParam; i++)
    {
        arrayParam[i] = 9;
    }

    return true;
}
void main()
{
    int* myArray = new int[30];
    bool res = initialiseArray(myArray, 30);
    delete myArray;
}
```

(6 Marks)

(c) What is a dangling pointer?

(2 Marks)

(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 in the middle of a container.

(4 Marks)

- Getting the kth element in the container.

(4 Marks)

(b) Rent-A-Wreck has a large number of vehicles for rent worldwide. There is high turnover of vehicles every year. Due to the large number of vehicles it needs to store vehicle information in an appropriate data structure. A vehicle has a chassis number and a make.

- Provide a class **Vehicle** with which instances can be linked forward and backwards to others instance of **Vehicle**.

(6 marks)

- Implement a method which adds an instance of **Vehicle** to the linked list before a given instance of **Vehicle**.

(6 marks)

[20 Marks]

Q.4. (a) Describe, using an example, the purpose of a function template.

(5 Marks)

(b) The function defined below returns the product of the first *n* elements of an array of integers:

```
int calculateProduct(int data[], int n);
```

Provide an implementation for the function.

(2 Marks)

(c) Alter the function so that it will work with any object that supports the multiplication operator (*).

(5 Marks)

(d) What are the advantages/disadvantages of operator overloading?

(2 Marks)

(e) Provide the definition and implementation of a class that represents a 3D space vector i.e. a vector has an x, y, and z component. Overload the following operators for your class:

- Addition operator(+), to add two vectors.

(3 Marks)

- Subtraction operator(-), to subtract one vector from another.

(3 Marks)

[20 Marks]