



DUBLIN CITY UNIVERSITY

REPEAT EXAMINATIONS 2009/2010

MODULE:	EE553 Object-oriented Programming for Engineers
COURSE:	MTCC – M.Eng. in Telecommunications Eng. MEN – M.Eng. in Electronic Systems IPME - Individual Postgrad. Modules-Electronics MEQ - Masters Engineering Qualifier Course GCES – Grad Cert. in Electronic Systems GCTC – Grad Cert. in Telecommunications Eng. GDE – Graduate Dip. in Electronic Systems GTC – Graduate Dip. in Telecommunications Eng.
YEAR:	C
EXAMINERS:	Prof. Peter Ashburn Dr. Derek Molloy, Ext no. 5355
TIME ALLOWED:	3 Hours
INSTRUCTIONS:	Answer Four Questions

Please do not turn over this page until you are instructed to do so

- The use of programmable or text storing calculators is expressly forbidden.
- Please note that where a candidate answers more than the required number of questions, the examiner will mark all questions attempted and then select the highest scoring ones

This is a computer based examination:

- Please use the answer book and the supplied USB key to complete your answers. For each question you attempt partly or completely electronically, please refer to it in the paper answer book.
- On the USB key & network, please use your ID number as the root directory and use separate subdirectories for each question attempted e.g. Q1 etc.
- You are responsible for ensuring that you have copied all the files that form your answers onto the USB key and network drive. Please double check.
- Any additional files required for the exam are on the network drive. The location will be announced at the beginning of the examination.

QUESTION 1**[TOTAL MARKS: 25]****1(a)****[14 Marks]**

Answer the following questions (keep your answers concise):

- (i) Describe the use of the *this* keyword in Java.
- (ii) Why are all methods in the Java *Math* class static?
- (iii) Why do pointers require a *dereference type* in C++?
- (iv) Describe the difference between the role of a compiler and an interpreter?
- (v) Describe how a union structure works in C++?
- (vi) Describe the use of the *break* and *continue* keywords in C++.
- (vii) Briefly explain the difference between *modal* and *modeless* dialog boxes in Java.

1(b)**[6 Marks]**

Examine the following section of code:

```
class A
{
    private:
        int x;
        friend class B;
};

class B
{
    x(A &a)
    {
        a.x++; // Point 1
    }
};

class C: public B
{
    y(A &a)
    {
        a.x++; // Point 2
    }
};
```

Why does the code work correctly at 'Point 1' and why does it fail at 'Point 2'?
Why are 'friends' used in C++?

1(c)**[5 Marks]**

Discuss the use of non-virtual methods in C++. In C++, why is non-virtual the default? Does Java have non-virtual methods, or an alternative to them?

[End of Question 1]

QUESTION 2**[TOTAL MARKS: 25]****2(a)****[7 Marks]**

Describe the following C++ STL categories: Containers, Iterators and Algorithms. Concisely describe four examples for each category.

2(b)**[6 Marks]**

Write some C++ code that stores values of any standard type (e.g. int, float, double etc.) in a STL vector, uses a STL algorithm to sort the data and then displays the values using a STL for_each algorithm. Note: the output function should work for any standard type.

2(c)**[6 Marks]**

List the four C++ explicit casts and describe and explain their uses.

2(d)**[6 Marks]**

Write a code example that demonstrates the use of the different casts described in part (c).

[End of Question 2]

QUESTION 3**[TOTAL MARKS: 25]****3(a)****[10 Marks]**

Write the implementation for the following class definitions and write a main() function to test them.

```
class Person {
    string name, id;
public:
    Person(string, string);
    virtual void display();
    virtual string getRole() = 0;
};

class Student: public Person {
    string programme;
    int year;
public:
    Student(string, string, string,
    int);
    virtual void display();
    virtual string getRole();
};
```

```
class Lecturer: public Person {
    string office;
    int phoneNum;
public:
    Lecturer(string, string, string,
    int);
    virtual void display();
    virtual string getRole();
};
```

3(b)

[7 Marks]

Write a template storage container that is capable of storing a specified number of generic objects. It should have the capability to return the number of objects in the store, to return an indexed object and a simple mechanism for adding an object to the end of the store.

3(c)

[3 Marks]

Use the storage container from (b) to create a Person store that is capable of storing both Student and Lecturer objects. Write code to test this store.

3(d)

[5 Marks]

Use the STL vector class to perform the same tasks as your storage container and repeat part (c) using the STL vector.

[End of Question 3]

QUESTION 4

[TOTAL MARKS: 25]

4(a)

[9 Marks]

Write an applet that looks like the applet in Figure 4.1. The applet should allow the user to enter text in the text field. When the user presses "Upper case" the string in the box should be converted to an uppercase form – e.g. "Hello" would become "HELLO". Similarly when the "Lower case" button is pressed the string in the text field should be converted to a lowercase form, e.g. "Hello" would become "hello". Write a html page to contain this applet.

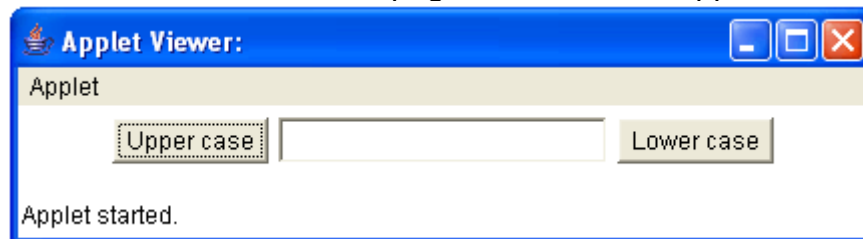


Figure 4.1, The Uppercase/Lowercase applet

4(b)

[4 Marks]

Convert your applet from (a) into a Java application.

4(c)

[7 Marks]

What are Java interfaces? Why and when are they used? How might you apply user defined interfaces to part (a)/(b), where it describes a window frame that could be called from any other application?

4(d)

[5 Marks]

Discuss the difference between arrays of objects in C++ compared to arrays of objects in Java? In particular, compare `SomeClass[] a = new SomeClass[5];` to `SomeClass a[5];`

[End of Question 4]

QUESTION 5**[TOTAL MARKS: 25]****5(a)****[9 Marks]**

Explain using an example why you would need to synchronize a segment of code when using Java threads (Your answer should show a line-by-line step through of a segment of code, explaining why it would not work correctly if the segment of code was not synchronized). If synchronization is a solution to making an application thread safe, then why should we not just synchronize all our code?

5(b)**[16 Marks]**

Write a Java client/server pair, where the client sends a Vector (java.util.vector) object containing a number of words to the server and the server sorts the vector alphabetically and sends back a vector with the sorted words. The client should then display the sorted words.

e.g. Send – ["Hello" "World" "Dog" "Cat" "House"] as a Vector and receive back ["Cat" "Dog" "Hello" "House" "World"].

You have been supplied with three sets of code to handle the basic aspects of this application: Client.java, Server.java and ConnectionHandler.java

[End of Question 5]

[END OF EXAM]