DUBLIN CITY UNIVERSITY

SEMESTER ONE EXAMINATIONS 2007

MODULE:	Object-Oriented Programming for Engineers - EE553
COURSE:	M.Eng./Grad. Dip./Grad. Cert. in Electronic Systems M.Eng./Grad. Dip./Grad. Cert. in Telecoms. Eng. RAEC – Remote Access to Continuing Eng. Education MENN
YEAR:	Postgraduate (C)
EXAMINERS:	Dr. Derek Molloy (DCU ext. 5355) Prof. Paul Rees (External Examiner)
TIME ALLOWED;	3 Hours
INSTRUCTIONS:	Please answer <u>FOUR questions.</u> All questions carry equal marks

Requirements for this paper

Log Table X Floppy Disk

THE USE OF PROGRAMMABLE OR TEXT STORING CALCULATORS IS EXPRESSLY FORBIDDEN

• Please use the answer book and the supplied disks to complete your answers to this exam. For each question you attempt, either partly or completely electronically, please refer to it in the paper answer book.

• On the disk & network, please use separate directories for each question attempted, e.g. question1 etc.

You are responsible for ensuring that you have copied all the files that form your answers onto the disk and the network drive. Please check that all files are on the disk.
All files required for the exam are on the network drive. The location will be announced at the beginning of the exam.

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.

PLEASE DO NOT TURN OVER THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

1(a) Answer the following short questions (keep your answers concise):

- (i) What is the rationale for passing an object by constant reference?
- (ii) Why are destructors always non-virtual in C++?
- (iii) Explain the use of the Object class and Class class in Java.
- (iv) In C++ the "->" operator allows you to call a method on a pointer to an object. If this operator was not available, what would you write to do the same operation?
- (v) Explain the difference between the terms declaration and definition?
- (vi) Describe the use of the conditional operator "?".

[12 marks]

1(b) List the four main C++ explicit casts and explain when and why you should use each one. Use a short segment of code to help with your explanations.

[8 marks]

1(c) Discuss the different access specifiers (e.g. public etc.) available in the Java programming language and explain their differences.

[5 marks]

Question 2

2(a) Write the Java Swing Calculator Application as illustrated in Figure 2.1. The Calculator should have the facility to multiply, divide, add and subtract floating point numbers, which can be entered through the buttons. The clear key "C" should reset the current operation. Importantly, you should not cut-and-paste code to create this application, this applies in particular to the buttons.

EE553 Calculator				
6.666665				
7	8	9	3	
4	5	đ		
1	2	3		
O	С	+	=	

Figure 2.1. The Calculator Application.

[20 marks]

2(b) 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];

[5 marks]

3(a) Write the implementation for the following class definitions and write a main() function to test them – Please add new methods if they are necessary:

#include <iostream> #include <string> using namespace std;</string></iostream>	class CurrentAccount: Account
class Account { protected:	float overdraftLimit;
float balance; int accountNumber; string owner; static int nextAccountNumber;	CurrentAccount(float, string, float); CurrentAccount(Account, float); virtual void display(); virtual bool makeWithdrawa!(float &);
<pre>public: Account(float, string); Account(float); Account(); virtual void display(); virtual bool makeWithdrawal(float &); virtual void makeLodgement(float &); };</pre>	Please note: This code is supplied on the network drive to get you started. [15 marks]
int Account::nextAccountNumber = 12345;	

3(b) Use a single *STL vector class* to store a number of Account and CurrentAccount objects. Iterate over the vector and call the display() method of each object.

[5 marks]

3(c) Explain *friend functions* in C++, including a discussion on the advantages and disadvantages. Using a short segment of code illustrate the "inheritance" and "transitive" rules associated with friend functions.

[5 marks]

4(a) The java.util.Math contains many mathematical operations. In your opinion, why is there no constructor for the Math class? Show an example of how you would use the random() method to pick a random whole number between 1 and 100 (inclusive).

[5 marks]

4(b) Using the Java API documentation, with reference to the class *java.util.Calendar* and *java.util.GregorianCalendar* write the Java Swing Application as illustrated in Figure 4.1. The user should be able to enter the day of the month, the month from a drop down list and the year. When the user presses "Calculate" the day of the week on that date is displayed in the field to the right.

🗧 EE553 Oate	Application		
Day: 25 N	Nonth: Jan 👻 Year: 2007	Calculate Day of the week:	

Figure 4.1 The Java Swing Date Application

[20 marks]

5(a) Compare the C++ language to the Java language under the following headings only:

- Virtual and non-virtual methods
- Nested classes
- Global functions
- Memory management

[8 marks]

5(b) Write a Java client/server banking application, where the client passes a Deposit Account object to the server; the server operates on the object calculating the interest due, based on the server's interest rate; and then returns the object back to the client. Write an appropriate Deposit Account class. You have been supplied with three classes to handle the basic aspects of this application. These are called:

- Client.java,
- Server.java
- ConnectionHandler.java

These files are in the directory question5. An example client/server output is shown below in Figures 5.1 and 5.2.

- Command Prompt - java Server	⊐×
D:\My Documents\My Teaching\EE553 (2006~2007)\Question5 Solution>java Server Start listening on port 5050 Accepted socket connection from client Applying Interest at 5%	
Sending DepositAccount@13caecd	-

Figure 5.1 The Server Example

Command Prompt	- 🗆 ×
D:\My Documents\My Teaching\EE553 (2006-2007)\Question5 Solution>java Cli alhost Connected to Server Present Deposit Account: Account with number:12345 with owner: Derek Molloy and with halance: 10000999.0	ent lac
Sending account Sending DepositAccount@fe64b9 Updated Deposit Account: Account with number:12345 with owner: Derek Molloy and with balance: 1050000.0	
D:\My Documents\My Teaching\EE553 (2006-2007)\Question5 Solution>	•

Figure 5.2 The Client Example

[17 marks]