Ollscoil na hÉireann, Gaillimh ***GX_____***

National University of Ireland, Galway

Semester I Examinations 2008 / 2009

Exam Code(s)	3IF1
Exam(s)	Third B.Sc. (Information Technology)
Module Code(s)	CT331
Module(s)	Programming Paradigms
Paper No.	I
External Examiner(s)	Prof. J.A. Keane
Internal Examiner(s)	Prof. Gerard Lyons
	Dr. Jim Duggan

Instructions: Answer any THREE Questions

Duration	2 HOURS
No. of Pages	3
Department(s)	Information Technology
Course Co-ordinator(s)	Dr. Des Chambers

Requirements:

OLLSCOIL NA hÉIREANN
NATIONAL UNIVERSITY OF IRELAND, GALWAY

SEMESTER I, WINTER 2008-2009 EXAMINATION

Third Year Examination in Information Technology

Programming Paradigms (CT331)

Professor J.A. Keane
Prof. Gerard J. Lyons
Dr. Jim Duggan

Time Allowed: 2 hours

Answer any THREE questions

1. (a) On the .NET platform, distinguish between *managed code* and *unmanaged code*. (40% of marks).

   (b) For a Bank Account class, define a property that can set or retrieve the *accountNumber*. Summarise the benefits of properties in object-oriented languages. (30% of marks).

   (c) In C#, write a class method that takes in two integers, and returns (by reference) the sum, product, and difference of the two numbers. Explain why this would be difficult to implement in Java. (30% of marks).

2. (a) Describe an event, and explain how an event can play an important role in building modern software applications. Distinguish between an event and a delegate. (30% of marks).

   (b) Make use of events to code a simple publisher/subscriber system that broadcasts headline news items to registered clients. Subscribers should have a way of registering, and as they register, they should provide a callback function. This function will receive the update in string format. The publisher should keep an archive of all news events, using any standard collection object. The collection object should be declared using generics. (70% of marks).

3. (a) Draw a diagram showing the main classes in the .NET Reflection API, and describe the main purpose of each class. (30% of marks).

   (b) For a given Type t, show how you would list (1) all methods of the type, (2) all constructors of the type, and (3) all the static fields of the type. (40% of marks).

   (c) Given a string representation of a class, clearly show the steps you would take in order to instantiate an object of that class. Outline the advantages that this facility provides for software developers. (30% of marks).

4. (a) Define an iterator, and summarise why it is a useful feature of C#. (20% of marks).

   (b) For an account with a collection of transaction objects, use the default iterator to return each transaction in reverse order from the collection. (30% of marks).

   (c) Extend the solution in (b) by developing custom iterators that implement the IEnumerator interface (e.g. public Object Current; public bool MoveNext(); public void Reset()). (50% of marks).

5. (a) Use an abstract class to create a proxy cache solution for a collection lookup. The collection (e.g. an ArrayList of Student objects) can be viewed as the original, and the proxy contains a reference to the original, as well as a simple array cache of N objects, where N is defined at startup, and expected to be far smaller than the size of the original collection.

   Each object in the collection will have a unique identifier (student id). When a request arrives at the proxy, if the object is on the cache, it is returned. If the object is not on the cache, it is retrieved from the collection, placed in the cache, and returned. If the cache is full, the new object will replace the oldest object on the cache.

   (b) Describe the key idea and advantage of asynchronous delegates, and outline, using a simple example, how they can be used in C#. (30% marks)