DBS Dublin Business School
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QQI

ICT

February 2014 EXAMINATIONS

Module Code: **B8IT052**

Module Description: **Object Oriented Programming 1**

Examiner: **Kevin Coady**

Internal Moderator: **Paul Kelly**

External Examiner: **Pat Donnelly**

Date: *Monday 10 February 2014*
Time: *10.00 – 12.00*

INSTRUCTIONS TO CANDIDATES:

Time allowed is 2 hours.

QUESTION 1 IS COMPULSORY.
You must answer Question 1 in the booklets provided

Answer any 2 other questions.
All other questions to be answered using the computer

Question 1 – Compulsory – 30 Marks

1. What is meant by the four pillars of object oriented programming? Explain each one. **(10 Marks)**
2. Explain the differences between abstract classes and interfaces. Give examples, including appropriate C# code, to show how abstract classes and interfaces are both defined and used **(10 Marks)**
3. What is meant by generic collections in relation to C#? Give an example of how this would be used in code. **(5 Marks)**
4. Explain what is meant by overriding and overloading. Give C# examples for each. **(5 Marks)**

(30 marks)

Question 2 - 35 Marks

DBS Sports Society wishes to create a piece of software for all the field sports played in the college. You have been asked to provide a prototype of this software.

There are several types of field games played in DBS such as football, rugby and hurling
All games share certain common attributes (Properties) as follows:

- Name of game (*e.g. "football"*)
- Number of players per team (*e.g. 11*)
- Description (*e.g.* "*Kicking a ball with your foot to score a goal*")
- Pitch Dimension (e.g. 115 x 74)

Additionally all games have the following behaviours (Methods)

- HowToScore – describes how a score occurs in the game (e.g. "*A goal is scored when the ball passes over the white line between the posts*")

I. Provide C# code for Pitch Dimensions which can store the length and width of a pitch and can calculate the area of the pitch **(3 marks)**
II. Provide C# code which defines an interface ISport based on the above description **(7 marks)**
III. Provide C# code for a class named Football which implements the ISport interface. Your implementation must contain at least two constructors. **(7 marks)**
IV. The class Football should implement the IComparable interface. **(6 marks)**
V. The class Football should also overload the equality operators (== and !=). Two instances should be considered the equal if the name property and number of players property in one instance of Football contain the same values as another instance of Football. **(7 marks)**
VI. Provide test code which ensures your implementation is correct. **(5 marks)**

(35 marks)

Question 3 - 35 Marks

Please answer both I **AND** II for this question.

I. Provide a UML class diagram for the details below **(7 marks)**
II. Provide C# implementation for the details below

a. An Address Class **(7 Marks)**
   - Include properties for the following
     - House number
     - Street
     - City
     - County
   - A ToString method which returns the details held in this class. (i.e. the properties of the class).

b. A Person Interface **(7 Marks)**
   - Include properties for the following
     - Title
     - First Name
     - Surname
     - Address (Use the class already created)
   - A method to update a person's name (has parameters title, first name and surname)
   - A method to update a person's address (i.e. has parameter of type Address)

c. A Person Class **(7 Marks)**
   - This class must implement the Person interface
   - A constructor which includes the following parameters
     - person's title
     - first name
     - surname
     - address
   - A default constructor which has no parameters

d. A Student Class which extends a Person **(7 Marks)**
   - Create the properties for the following
     - Student Id
     - Course
   - A constructor which accepts a student's title, first name, address, student id and course.
   - Override the ToString method to display all properties in this class as follows:

   Name: Mr John Murphy
   Address: 1 Main St, Dublin City, Dublin
   Student Id: 1799999
   Course: Higher Diploma in Science in Computing

(35 marks)

Question 4 – 35 Marks

Dublin Business School requires some software to keep track of payments to both full time and part time lecturers. Full time lectures are paid a fixed monthly salary, while part time lectures are paid an hourly rate. You are required to develop software to help keep track of company wages. Write a program with the following details

I. An abstract class named Employee. It should have the following: **(10 marks)**
   a. Private properties to hold the following information:
   b. Name
   c. Id
   d. Implement a method which accepts a name and id as parameters.
   e. A method with no implementation named CalculateWages, which returns the employee monthly wage.

II. A class named Lecturer which is based on Employee. It should have the following: **(7 marks)**
   a. A default constructor which accepts no parameters.
   b. A constructor that allows a name, a staff id and a yearly salary to be passed as parameters
   c. A private property for setting and retrieving the yearly salary
   d. An implementation of CalculateWages which returns the monthly salary.

III. A class named PartTimeLecture which is based on Employee. It should have the following: **(7 Marks)**
   a. Properties for the following:
      - The hourly rate
      - The amount of hours worked in a month
   b. A constructor with parameters for specifying the name and the staff id and the hourly rate.
   c. A constructor with parameters for specifying the name and the staff id, the hourly rate and the number of hours worked in the month.
   d. An implementation of CalculateWages which will return the amount to be paid to the part time lecturer for the amount of hours they have worked.

Note: you must also provide at least one implementation of overriding the ToString method. **(4 marks)**

Provide a program which tests the implementation of you code. Output similar to the following should be displayed on screen. **(7 Marks)**

Lecturer:
Name: John Doe
Id: 123
This Months Wages: 1200.50

Part Time Lecturer
Name: Mary Doe
Id: 124
This Months Wages: 909.25

(35 marks)