UNIVERSITY OF RUHUNA

BACHELOR OF COMPUTER SCIENCE (GENERAL) DEGREE

LEVEL II (SEMESTER II) EXAMINATION – NOVEMBER/DECEMBER 2016

COURSE UNIT: CSC 2213 – Rapid Application Development (Theory) **Duration: 2 hours**

Answer **all** four questions

1)

a) List three major differences between classes and structures in C#.

b) Explain events in C# using the component model of .NET framework.

c) Briefly explain the types of access modifiers available in C#.

d) Write two main purposes of the Singleton design pattern.

e) Briefly explain *sealed* and *readonly* keywords in C#.

f) Draw UML class diagram for the Singleton design pattern.

2) Sampath web card is a pre-paid VISA card exclusively designed to make web based online payments. WCN (Web Card Number) and CVV (Card Verification Value) are two numbers associated with a web card. The WCN has 16 digits and CVV has 4 digits. These two numbers are kept securely in an information system in the bank. The user has to provide correct username and password in order to view these two numbers. Considering the above description, use proxy design pattern in C# to answer following questions.

a) Write the code to create the interface (interface class) which has only one method signature to return a string value.

b) Write the code to create a class called *WebCard* containing two methods. One method should return WCN number as 3456 9854 2781 7458 and the other method should return CVV number as 936.

c) Write the code to create the proxy class which includes a method for authentication with two parameters: username and password. The return type of the authentication method must be void. If the authentication failed, the user should get the message "Please authenticate". After successful authentication, the user should get the message "WCN = 3456 9854 2781 7458; CVV = 936".

d) Write C# code segment to test your program by considering all the possible test cases.

3) There are three types of triangles in geometry: equilateral, isosceles, and scalene. A triangle with its all sides having equal lengths is called an equilateral triangle. A triangle with only two sides are of equal length is called an isosceles triangle. A triangle with all sides having different lengths is called a scalene triangle. Use C# to answer the questions given below.

Note: The perimeter of each type of triangles can be computed as follows.

Triangle	Lengths of sides	Perimeter
Equilateral triangle	{a, a, a}	3 * a
Isosceles triangle	{a, a, b}	2 * a + b
Scalene triangle	{a, b, c}	a + b + c

a) Write the code for an abstract class called *ATriangle* which contains only three members: a variable called *p* to store the length of the perimeter, an abstract read-only property called *Perimeter* to get the value of the perimeter, an abstract method called *ComputePerimeter* to compute the perimeter of the triangle.

b) Write the code to create a class called *TriangleE* to represent equilateral triangles that inherits from the class *ATriangle* written in (3) (a) above. The class should include a constructor which takes the length of a side of the triangle as the only parameter.

c) Write the code to create a class called *TriangleI* to represent isosceles triangles that inherits from the class *TriangleE* written in (3) (b) above. The class should include a constructor which takes the lengths of two sides of the triangle as the only two parameters. Use *base* keyword to access the super class constructor.

d) Write the code to create a class called *TriangleS* to represent scalene triangles that inherits from the class *TriangleI* written in (3) (c) above. The class should include a constructor which takes the lengths of three sides of the triangle as the only three parameters. Use *base* keyword to access the super class constructor.

e) Write the code to create a class called *Creator* using factory method design pattern. The class should include a method which takes the lengths of the sides of a triangle as only three parameters. The method should decide the triangle type and create a triangle object. Further the method should return a reference to the created triangle object.

4) A point on a plane can be represented using coordinates (x, y). The Euclidean distance from the point to the origin can be computed by the expression $\sqrt{(x^2 + y^2)}$. And the city block distance from the point to the origin can be computed by the expression $|x| + |y|$. Use C# to answer the following questions.

a) Write the code to create an interface (interface class) called *Point* that has two method signatures to return Euclidean and city block distances respectively.

b) Write the code to create a class called *Point2D* by realizing the *Point* interface written in (4) (a) above. The class should have a constructor to initialize *x* and *y* coordinates.

c) A point in 3D space can be represented using coordinates (x, y, z). The Euclidean distance from the point to the origin can be computed by the expression $\sqrt{(x^2 + y^2 + z^2)}$. The city block distance from the point to the origin can be computed by the expression $|x| + |y| + |z|$. Using the decorator design pattern, write the code to create a class called *Point3D* by decorating the *Point2D* class written in (4) (b) above.

d) Write the code to create a 4D point with coordinates (10, 20, 50, 30) using the classes written in (4) (b) and (4) (c) above.