The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical and Computer Engineering

Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	**:EEI4562/ECI4262 Object Oriented Design and Programming**
Academic Year	: 2017/2018
Date	: 11th February 2019
Time	: 0930-1230hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Six (6)** questions in **Four (4)** pages.
3. Answer the **Two (2)** compulsory questions given in **Section A** and any **Three (3)** questions from **Section B**. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test (CBT).
6. Answers should be in clear handwriting.
7. Do not use Red colour pen.

Section A: Answer all questions given in this section

[Q1] Draw a use case diagram for the functional requirements of the system given below.

Consider an online reservation system for a long-distance servicing bus company. The bus company owns several buses and realizes trips to different cities. Each bus is identified by its plate number and a separately assigned bus number. The trips are based on a predefined schedule and stop at predefined bus stations. Each bus can have only one trip per day. Each bus includes a driver and one assistant. For long trips, the bus will stop at service and rest areas. There are two types of trips, normal trips and express trips. Express trips do not stop at intermediate stations and get to the destination faster.

Seats can be reserved by customers on the web site of the bus company. The customer has the option to directly pay for the seat through the website. In that case, the seat cannot be cancelled (neither by the customer nor by the bus company). If the customer has not paid for the seat or if the customer does not show up one hour before the trip, the bus company can cancel the seat. When the reservation is cancelled, the seat will become free and can be sold to another customer. Both the customer and the company staff must authenticate themselves for performing operations with the online reservation system.

[20 marks]

[Q2] Consider the following scenario when answering the given questions.

A computer store wants to acquire an automated tool to handle orders. An order can be placed by registered customers. An order consists of a number of items with the quantity required. The system should maintain the stocks and keep track of the stock level of each item. The order status is either "pending" or "serviced". There are two strategies to generate invoices for the orders. The first strategy is an order is serviced only if the stock level meets the request. An invoice is generated at the time of servicing the order. The second strategy is to generate an invoice based on the current item prices (at the time of the order is being serviced). The system should allow to extend a set of complementary requirements regarding placed and serviced orders.

a). Develop the class diagram for the given system showing the relationships among the classes.

[12 marks]

b) Name **four** (4) Types of UML diagrams (other than the class diagram and the use case diagram) and describe the main purpose of each.

[08 marks]

Section B: Answer any **Three (3)** questions from this section

[Q3]

a) Write a Java program to perform the following operations
  (i) Create a class named *"Item"*.
  (ii) Add two private instance variables *"id"* and *"name"* inside the class *"Item"*.
  (iii) Add public getters and setters for the two instance variables inside the *"Item"* class.
  (iv) Create a class named *"Main"* with a *"main"* method inside it and create an instance of *"Item"* class inside the *"main"* method with the following values.
      id = 100
      name = Book
  (v) Use the getter method of name variable to print the name of the student instance created inside main method.

[10 marks]

b) Briefly explain *"encapsulation"* using the written program in part(a).

[05 marks]

c) Explain the difference between a variable in a class that is declared static and one that is not.

[05 marks]

[Q4]

a) Name **three (3)** advantages of using design patterns.

[06 marks]

b) Name and describe the three main categories of design patterns.   [03 marks]

c) What are the uses of following design patterns?
  - Factory Pattern
  - Singleton Pattern
  - MVC Pattern

[06 marks]

d) Illustrate one of the design patterns given in part(c) using a suitable class diagram.

[05 marks]

[Q5]

a) What do you mean by dynamic initialization of a variable in Java? Give an example.

[05 marks]

b) What is bytecode? Explain its usefulness while translating a Java program in a wide variety of environments.

[05 marks]

c) Write a Java program that will perform the following operations.
  i) Create an object of type *ArrayList* that will contain a list of floating-point numbers.
  ii) Now insert the following data: 12.34, 34.5, 5.6, 7.89, 10.12, 3.45
  iii) Show the number of elements in the object.
  iv) Remove 5.6 and 10.12
  v) Display the content of the object.

[10 marks]

[Q6]

a) Explain the access modifiers 'public', 'private' and 'protected' in Java.

[06 marks]

b) Explain the following terms with respect to exception handling.
      i)   try/catch
      ii) throw
      iii) finally

[06 marks]

c) What is an Anonymous class in java?

[04 marks]

d) Briefly explain *scope* and *lifetime* of a variable using an example.

[04 marks]