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

00031

Study Programme	: Bachelor of Software Engineering Honours
Name of the Examination	: Final Examination
Course Code and Title	: **EEI6567/ECI6267 Software Architecture and Design**
Academic Year	: 2017/18
Date	: 16th February 2019
Time	: 0930-1230hrs

General Instructions

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

Section A - Answer all questions in this section

1. Your company is asked to develop a software system to automate the railway ticketing process and you are the architect. Following features are expected from this new solution.

   - Users should be able to create an account in the system and maintain a profile with their details. This feature should have the facility to generate an ID with a QR code.
   - People should be able to purchase tickets (including monthly/weekly concessionary season tickets) online.
   - All the officers who are checking tickets on the train as well as in railway stations are equipped with a smart device, that can read the QR code and check whether the passenger has purchased a ticket for the journey.
   - All the railway stations will be equipped with many smart devices, that can be used to purchase tickets.

   a) It is obvious that, this kind of an improvement to the ticketing system is costly. Is it worth spending money for this kind of a project? Explain with reasons. [03 Marks]

   b) Identify three more features that can be added to the proposed system. [03 Marks]

   c) Draw a use case diagram for this system. [03 Marks]

   d) Identify major software components [05 Marks]

   e) List down the stakeholders of this system. [02 Marks]

   f) Draw a diagram to depict the high-level architecture of this system. [06 Marks]

   g) Identify two non-functional requirements that need to be considered in this system. Explain why these are important in a railway ticketing system. [03 Marks]

2. *"NewPower"* is a company, that manufactures smart electricity and water meters, which does not require human intervention to read and calculate the monthly bills. Ceylon Electricity Board has agreed to use these devices as a service. These devices will be installed as meters, and CEB is paying *NewPower* an agreed percentage from each bill.

   Features that this system should support are:

   - users should be able to view their daily electricity usage and monthly bill.
   - users should be able to pay online using credit card, paypal or any other payment method.
   - users should be able to see the current reading of the meter.
   - by default, the users will be getting a printed electricity bill by post, but a user can mark this as unwanted.

a) Identify two major use cases of this system. [03 Marks]

b) Draw a diagram to depict the high-level architecture of this system. [07 Marks]

c) Draw sequence diagrams for, *a user reading the current reading* and *generating monthly bill.* [10 Marks]

d) State two design patterns that can be used in this system, and briefly explain how to use them. [05 Marks]

Section B - Answer any two (2) questions from this section.

3. A software architecture defines both the structure and the behavior of a software system. Commonly the software architecture is organized in views, which are equivalent to different types of blueprints in building architecture. A view is a representation of a set of system components and their relationships.

   a) Briefly explain two architectural views that can be used to visualize a system. [10 Marks]

   b) Explain event-driven architecture using a real-world example. Name the components or parts of event-driven architecture in your example. [15 Marks]

4. There are more than 2 billion smartphones in use. Almost all the enterprise applications are developed to support mobile access and the organizations are looking at more avenues to extend their existing applications to support mobile access.

   a) Explain how easy it would be, to extend an application developed using a layered architecture. [10 Marks]

   b) Draw a high level architecture of service integration layer using a suitable example. [15 Marks]

5. *IoTWorld* is a software company, that provides IoT solutions. They have a product, that they modify for each of their customer's need. Recently, they want to change their product from Service Oriented Architecture (SOA) to Microservices architecture. Their engineering team has analyzed their current code base and realized that its components are heavily coupled and complex. Therefore, they decided to enforce well known principles like SOLID.

   a) Explain the concepts of *Single Responsibility Principle* and *Dependency Inversion principle* with examples for each. [08 Marks]

   b) Define the terms *Coupling* and *Cohesion* and explain how these are related [08 Marks]

   c) Briefly explain how "*Agile*" software development methodology would help in the task given above. [09 Marks]