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THE OPEN UNIVERSITY OF SRI LANKA
Faculty of Engineering Technology
Department of Electrical & Computer Engineering

Bachelor of Software Engineering Honours

Final Examination (2016/2017)
ECI6267: Software Architecture and Design

Date: 09 December 2017 (Saturday) **Time: 9:30 am –12:30 pm**

1. This paper contains six (6) questions in two Sections. Answer **the two(2) questions from Section A** and **any two (2) questions from section B**. All questions carry equal marks.
2. Assume reasonable values or any suitable assumptions for any data not given in or if any doubt as to the interpretation of the wording of a question. Clearly state such assumptions made on the script.
3. You are NOT allowed to use any study material or any other electronic resource during the examination.

Section A
Answer **all** questions from this section.

Q1. Answer the following questions based on the given scenario.

"HomeAsistant" is a new product your company develops and you are the software architect. This is a product to be deployed in the *Cloud*. It is an IoT application that controls and monitors domestic equipments, cameras and other security system components, refrigerators, thermometers, and many other. Assume those devices are IoT capable.

- There are two types of connections, polling connection and pushing connections. Type of the connection is decided based on the device type. For instance, thermometer in the kitchen is a pushing type, it pushes or alerts cloud application with its readings in every 5 minutes.
- The data collected from devices are stored in cloud for future reference.
- This application should also support a device registration/un-registration that you can register and unregister devices.

a) List down and explain two advantages of this kind of an application for a modern home.
[02 Marks]

b) Identify major components of the system.
[04 Marks]

c) What are the best design pattern for polling type connection and for the pushing type of connection? Briefly explain both patterns considering the components identified in *part b*.
[04 Marks]

d) Draw a diagram to depict the high level architecture of this system that you are going to design.
[08 Marks]

e) Provide a class diagram to describe the high level domain model of the system.
[04 Marks]

f) Discuss two non-functional requirements need to be considered in this system.
[03 Marks]

Q2. Answer the following questions based on the given scenario.

Your company is providing a high available Data Store. High availability is achieved using many redundant data servers. As an improvement to the system, you are asked to develop a monitoring system for this Data Store. Using this software, an admin should be able to,

- view available data servers and their state
- start and stop those servers
- start more servers and add them to the cluster/to the set of nodes
- There should be a separate alerting service that alerts system failures to admins, via SMS and email.

a) Identify two use cases.

[06 Marks]

b) Draw a sequence diagram for alerting scenario when a server is down.

[08 Marks]

c) Identify major components of the system

[04 Marks]

d) What is the best design pattern to be used for the alerting component of this system? Explain.

[07 Marks]

Section B

Answer **any two (2)** questions from this section.

Q3.

a) Briefly explain Software Architecture Business Cycle.

[04 Marks]

b) What are the main categories of architectural structures?

[03 Marks]

c) What is software modeling and why do we need that?

[03 Marks]

d) Explain *Dependency Inversion Principle* in your words.

[07 Marks]

e) What is the importance of *cohesion* in an application component? Explain using an example.

[08 Marks]

Q4.

Answer following questions on Architectural Design.

a) One of the major goals of the software design concepts is to "Resolve common design challenges". How do you achieve this in an agile environment?

[06 Marks]

b) What is the concurrency problem? Explain the known solutions for the problem in your words.

[07 Marks]

c) There are mainly two types of connection between components called Synchronous and Asynchronous. Briefly explain each.

[06 Marks]

d) What is *Event Driven Architecture* style? Is it *Synchronous* or *Asynchronous*? Explain.

[06 Marks]

Q5.

a) What is Test Driven Development(TDD) and what are the benefits of using TDD?

[03 Marks]

b) In what stage of the development you write tests in TDD? [04 Marks]

c) Take a simple example and explain how you apply TDD. [06 Marks]

d) Why TDD evolved to BDD (Explain the limitation of TDD that caused this) [06 Marks]

e) Explain how do you apply BDD to the example you have chosen in *part c.* [06 Marks]