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THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

BACHELOR OF SOFTWARE ENGINEERING

ECI6267 – SOFTWARE ARCHITECTURE AND DESIGN

FINAL EXAMINATION – 2015 / 2016 (CLOSE BOOK TYPE)

Date: 17 December 2016 **Time: 09:30 – 12:30 hrs**

INSTRUCTIONS TO CANDIDATE:

i.) Answer **Question 1** and any three questions from **Question 2** to **Question 5**. All questions carry equal mark.

ii.) 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.

iii.) You are NOT allowed to use any study material or any other electronic resource during the examination.

Question 1 – COMPULSORY QUESTION

"UtilPal" is the new application that your company develops and you are the architect for the new project. This software system provides a centralized platform to view and pay all the utility bills and also has the facility to add new utility providers (Assume that there are web services provided by CEB/LECO, Water Board and all other utility providers). Payments should be allowed using Debit/Credit cards and Paypal. There should be a reporting module that can generate reports and graphs.

a) Draw a diagram to depict the high level architecture of this system you are going to design.

[08 Marks]

b) Provide a class diagram to describe the high level domain model of the system

[09 Marks]

c) Discuss two non-functional requirements need to be considered in this system

[08 Marks]

Answer any three questions from Question 2 to Question 5

Question 2

Design by Contract is an approach for designing software

a) List the main steps of Design by Contract. Describe each.

[10 Marks]

b) Do a design to the "Account" abstract class shown below, following the Design by Contract concepts. (Assume that the account balance never becomes negative).

[15 Marks]

```
Public abstract Account {
      void deposit(double amount);
      void withdraw(double amount);
      double checkBalance();
}
```

Question 3

Answer following questions on Architectural Structures and Styles

a) State the three broad categories of Architectural Structures.

[03 Marks]

b) Briefly describe Pipe and Filter architectural style, use a diagram to identify its components.

[08 Marks]

c) Identify at least two benefits and two drawbacks of layering in of Layered Architectural Style and elaborate them.

[08 Marks]

d) Briefly explain Event Driven Architecture and identify three main components of it using a diagram

[06 Marks]

Question 4

One of the key roles of Disaster Management Centre (DMC) is to focus on creating plans to decrease the effect of disasters. DMC is willing to develop an in-house system to achieve this task and the details of the system are given below. DMC will receive Humidity, Wind, Temperature, Pressure, Rain and Nature of the Soil from different areas of the country. Based on this information the DMS will predict and notify possible occurrences of disasters to relevant parties. Further this expandable disaster management system wants to release an API for prediction and for sensor data, so that any developer can write their own applications, to predict weather conditions or to notify disasters to required parties. Most importantly, people should be able to subscribe to this service to receive notifications for their area or some other area he/she wish to subscribe in.

Answer following Questions on Service Oriented Architecture (SOA) referring the scenario given above.

a) Briefly describe what SOA is and identify the three main components.

[05 Marks]

b) Explain how scalability is achieved in SOA using an appropriate example given in the scenario.

[05 Marks]

c) Briefly explain what's referred to as high-availability of the given system.

[05 Marks]

d) Draw an appropriate diagram and explain how high-availability of this system can be achieved using SOA.

[10 Marks]

Question 5

Consider a database architecture solution for the scenario given under **Question 4** when answering the following questions.

a) Explain using a diagram, how databases will be organized in micro services and how it is different from monolithic database.

[10 Marks]

b) State what is data caching and how data caching can improve performance of the system.

[07 Marks]

c) Briefly explain what is clustering and how the cluster management can be applied to keep data integrity and consistence of the system.

[08 Marks]