THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF SOFTWARE ENGINEERING
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

ECI6267 – Software Architecture and Design

Final Examination - 2014/ 2015

Date: 5th September, 2015 **Time: 9:30 - 12.30 hrs**

Answer any four (4) Questions

Question 1

'Wesco' supermarket chain wants to build an e-commerce website to take their business online. They are going to sell items directly to customers over the web, and they will have to store information about users, their product stocks, product catalogs, orders, shipping addresses, billing addresses, and payment data.

a. Assuming you are the architect who is engaged with this system design, draw a diagram to depict the high-level architecture of the system you are going to design.

[8 marks]

b. Provide a class diagram you are using to describe the high-level domain model of the system.

[9 marks]

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

[8 marks]

Question 2

a. SOA is one of the famous Architectural styles in modern day software engineering. The principles of service-orientation are independent of any vendor, product or technology. A service-oriented architecture is essentially a collection of services. These services communicate with each other. The communication can involve either simple data passing or it could involve two or more services coordinating some activity.

i. Most SOA systems uses Web Services to expose underlying services to external consumer parties. Prior to web services, what are the technologies used as an alternative to the web services? (List at least two) **[4 marks]**

ii. Discuss the drawbacks those technologies (described in 'a') had when compared to Web Services and how Web Services has addressed them.

[7 mark

b. Software Designing is one of the major activities that architects are mostly involved. So, the architect should have a thorough designing knowledge when he or she is in the business.

i. Design by Contract (DbC) which is also known as contract programming is an approach for designing software. Describe three components needs to be considered in Design by Contract.

[3 marks]

ii. List two object oriented design principles you learned during this course.

[4 marks]

iii. Describe 'Adapter' pattern with a class diagram

[7 marks]

Question 3

Scalability is the ability of a system, network, or process to handle a growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth. For example, it can refer to the capability of a system to increase its total output under an increased load when resources (typically hardware) are added.

a. Methods of adding more resources for a particular application fall into two broad categories: horizontal (scale out) and vertical scaling (scale up). Explain those two categories, scale up and scale out.

[10 marks]

b. Like Scalability, Availability is also a non-functional requirement, which should be considered in system design. In modern cloud era, people are talking about high-availability. What does it mean by high-availability?

[7 marks]

c. When it comes to high available systems, most of the time the choice is a scale out design. Discuss why scaling out is mostly suited for a high available system.

[8 marks]

Question 4

a. As an architect, how do you consider table indexing in a software system? Describe your answer stating one advantage and one disadvantage and also when to use and when to not use table indexing.

[8 marks]

b. As an architect, why do you use data partitioning? Use an appropriate example to elaborate your answer with a very brief design. **[9 marks]**

c. In a software system, data to be cached should be decided very carefully. Discuss this statement by taking a suitable example. **[8 marks]**

Question 5

a. Assume, in a sales control system, there is a need of presenting a product wise daily sales summary report to the company management. Following solutions were discussed during the system architecture discussions.

- Have a materialized view in the same database.
- Database mirroring.
- A database schedule job to insert product wise daily sales summary records to a new table.

Now, the architect needs to take a decision by selecting a better approach and present the selected solution to the management.

i. Assume you are the architect of this team and discuss the approach you select out of the above three.

ii. State the reasonable assumptions that you have made when selecting the better approach.

iii. Discuss why the other two approaches are comparatively not that better.

[18 marks]

b. As an architect, you will have to be prepared to take critical decisions. You might have to make decisions such as "how to handle trade-offs such as durability vs performance or availability vs consistency"

Explain how and when do you approach each of these scenarios by taking suitable examples.

[7 marks]