COMP 2921: Software Architecture & Design

Final Exam : Set A

Total marks: 90

Section A : 30 – Very short Answer Questions

Section B :30 – Descriptive Questions

Section 3: 30 – Case studies

Section A [10+10+5+5]

Very Short Answer Questions

Question 1. Multiple choice questions: [10 marks]

(1) The main role of software architecture is to describe?

1. The structure of a client/server system
2. The overall structure of a software system
3. The software inside a building
4. The software classes and their relationships

(2) A structural view of a software architecture can be defined as:

1. a module hierarchy
2. only discrete objects and messages
3. Only a few components and connectors
4. The physical configurations in terms of nodes and interconnections

(3) How can you define the software architectural style?

1. It is the structure of the major subsystems of a system
2. It is just a small group of collaborating objects
3. A well-defined architecture structure that is used in a variety of systems
4. A definition of the various components and connectors in a software architecture

(4) The well-known layered architecture style is most appropriate for the development of the software applications that may require

1. Information separation
2. High data security
3. Performance quality
4. Ease of replaceability

(5) Which of the following objects should be assigned to the same subsystem?

1. Client and server objects
2. User interface and entity objects
3. Objects that are associated with each other
4. Objects that are part of the same composite object

(6) A user interface subsystem is a type of:

1. Control subsystem
2. Service subsystem
3. client subsystem
4. I/O subsystem

(7) What is a sequence diagram?

1. A diagram that shows interacting individuals along the top of the diagram and messages passed among them arranged in temporal order down the page
2. A diagram that shows messages super imposed on a diagram depicting collaborating individuals and the links among them
3. A diagram that shows the change of an individual’s state over time
4. All of the mentioned

(8) What are the communication characteristics of subscription/notification?

1. A message sent to several recipients
2. A message sent to a specific recipient
3. A message sent to all recipients
4. A message sent to recipients who have joined a group

(9) Which one of the following is NOT a good practice that will help you build an appli-

cation in the cloud?

1. Design, implement and deploy for automated recovery from failure
2. Ensure that the system can scale without any human intervention
3. Keep static data closer to the compute and dynamic data closer to the end-user
4. In the case of web application architecture, you can isolate the app server from the web server and from the database.

(10) What is NOT correct out of the following?

1. A secondary actor supports the primary actor
2. The primary actor supports the secondary actor
3. The primary actor uses the system to achieve a goal
4. A secondary actor is an external actor that may provide a service to the system under design

Question 2: State True or False [10 marks]

1. Design and architecture are often referred to as the \what" of the system and requirements as the \how".
2. Maintenance is one of the stages of software development.
3. Extend relationship is used to model an alternative path that may be taken sometimes.
4. Software engineers must always create components from scratch so that they may meet the customer expectations fully.
5. The UML sequence diagram show the order in which system events are processed.
6. Requirements engineering is a generic process that does not vary from one software project to another.
7. We may define a stakeholder as the one who may purchase the completed software system under development.
8. The use-cases are defined to help the software team understand how different classes of end-users will use functions.
9. The architectural representations can be used for the communication among various project stakeholders.
10. Various Quantitative methods for assessing the quality of proposed architectural designs are available.

Question 3: Match the following: [5 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| A | The well-known solutions to recurring design problems. |  | Pipe and filter architecture |
| B | The architectural style that may be used to design a system that can be divided into reusable, loosely coupled components, that may be later flexibly combined and arranged to transform between various data formats. |  | architectural patterns |
| C | The architectural style that may be used to design a system having several equally distributed computational entities that are connected via a common protocol to share their services. This style may provide high availability and scalability. |  | Multi-Tier Pattern |
| D | Distribute and allocate the components of a system in distinct subsets of hardware and software, connected by some communication medium. |  | Defines the structural view of the system |
| E | Static modelling |  | Peer-to-peer |

Question 4: Fill in the blanks: [5 marks]

Cohesion, coupling, Activity diagram, use case diagram, state chart diagram, class diagram, separation of concern, open/Close, no circular dependency, scalability, portability

* + 1. \_\_\_\_\_\_\_\_\_\_\_\_ is concerned with the relatedness within a module.
    2. \_\_\_\_\_\_\_\_\_\_\_\_\_ presents the process view of the system
    3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ presents the structural view of the system
    4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Issues that are not related should be handled in different components
    5. \_\_\_\_\_\_\_\_\_\_\_ is the possibility of making a software able to work on other platforms

Section B:[3+6+11+3+3+4]

Descriptive Questions

Question 1. Define and compare tight coupling and loose coupling. Which one is more desirable and why? [3 marks]

Question 2. For each of the following characteristics of a system, mark whether they are a functional requirement (FR), a quality attribute (QA) or a design constraint (DC)

[6 marks].



Question 3. Consider the following description:

An e-mail system filters incoming e-mails with a whitelist (e-mails from senders on the whitelist are accepted), a blacklist (e-mails from senders on the blacklist are deleted), and the Spamassassin tool (e-mails that do not pass this check are marked as spam). The system will run on a single-core server machine, but may be moved to a multi-core server if the load gets too high. [2+3+2+2+2]

* + - 1. Name one architectural pattern that you will use (not design pattern).
      2. Draw a diagram that describes your system architecture.
      3. Quickly explain in words how the system works.
      4. State the three most important advantages of using this architecture.
      5. State the two most important disadvantages of using this architecture

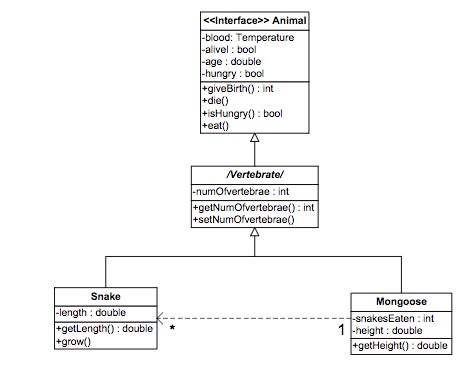
Question 4. List the three most important characteristics of a requirements specification Document? Explain why each of them is so important. [3 marks]

Question 5. Define IP? Define patent? [3 marks]

Question 6. What is Agile development? Where is it a good model for the software development? [4 marks]

Section C: [8+12+10]

Question 1. Given the diagram below:



Answer the following questions now:[4 x 2 marks]

1. What is the relationship between Vertebrate and Animal?
2. What is the relationship between Snake and Animal?
3. What is the association type between Mongoose and Snake?
4. According to the class diagram, can 2 mongooses eat 1 snake?

Question 2. [8+4 marks]

* 1. Draw a sequence diagram for the Library Management System
  2. How is it different for the communication or collaboration diagram.

Question 3. [10 marks]

For the following case study:

Follow the college registration system, where a student can look for the courses to register. But the registration may happen, if the student is logged in and have paid the fees already.

* 1. Draw the use case diagram [6 marks]
  2. Draw the activity diagram to show the sequence of operations for the same. [4 marks]

Sol: