CpSc 8750

MidTerm Exam

Name_____

Answer any FOUR of the five questions. Place a large X on the page for the question you are not answering. If you answer all five, I will eliminate the one on which you did the best. All questions are counted the same: 25 points each. Be certain to answer ALL parts of the questions you select to answer. When a question refers to either the architecture you developed in the project or specific examples that we developed in class, be certain to answer using the correct system.

Write clearly if you expect to be graded correctly. Answer the question that is asked and then stop. I reserve the right to deduct points for wasting my time.

You are allowed the notes you have taken, handouts, and printouts of assigned readings but no laptops.

1.

a. We discussed Testability and Modifiability as attributes that represent a tradeoff. Explain why there is a tradeoff between these two attributes.

The more modifiable the more flexible the architecture and the less reusable are the test cases

b. There are three standard types of architectural structures: module, component/connector, and allocation deployment structures. What is the use of each type of structure in an architecture design?

Modules – the decomposition is related to reducing complexity

Component/connectors – describes how instances of the modules are attached to each other

Deployment – where (as in on what platform it runs)

c. The Quality Attribute Workshop is one example of a group-oriented decision making process. What features of the QAW ensure that it is effective and accurate? For each feature explain how that feature contributes to success.

1. range of viewpoints – effectively avoids narrow interpretations

2. flexible number of votes – accurately reflects priorities

3. fixed format of input/output – accuracy

4. multiple waves of voting - effective

2.

a. List two attributes that the Model-View-Controller (MVC) architecture enhances and 2 that it degrades.

b. ADD is a process for creating an architecture based on the importance of quality attributes. While the attributes are ranked by number of votes they are also rated by criticality and likelihood to change. Explain what different actions a team might take for an attribute rated highly critical but not likely to change as opposed to an attribute that is rated low criticality but highly likely to change.

c. A layered architecture constrains the direction of dependencies to avoid cycles among the connections in the architecture. What is the reason for avoiding cycles? How can cycles be detected in an AADL description?

a. Enhances: maintainability, scalability Degrades: testability, security

b. Team will test more deeply for (H,L). Document less deeply for (L,H) until it settles and is less likely to change

c. Avoid cycles to ensure decomposition and substitutability. Detect by following flows

3.

a. A risk is an event that has a probability of occurring and a cost if it does occur. Describe one specific type of architectural risk and explain what architecture tactic is used to reduce the risk. How can Resolute be used to reduce risk?

b. Reliability is the probability a system will execute for the time period required. Describe one tactic for making a software system more reliable.

c. A tactic is applying a specific action on the architecture. You can think of it as a pattern that describes when to apply a transformation from one architecture to another and that describes the resulting modified architecture. Describe what is changed in the architecture when the "substitute" tactic is applied and what is unchanged.

a. Risk: needed system functions will be overlooked – Traceability between requirements and design modules ensures completeness - Resolute can be used to check that needed flows between modules are available

b. Decomposition will result in smaller pieces, which can be more extensively tested; redundancy is only successful if different implementations are used

c. The behavior or performance may have changed but the interfaces have not.

4.

a. A reference architecture is a reusable template for building application-specific architectures. List at least two specific ways that AADL supports the description of a reference architecture.

b. When using AGREE we often place the “assume” statements in the specification and the “guarantee” statements in the implementations. Why?

c. A design decision results in the selection of a tactic to apply. Describe one design decision we made in our “speed aware” architecture definition. What tactic resulted from that decision?

a. “abstract” declarations allow decisions to be delayed; allowing interface definitions to compile without data types; providing specifications without implementations

b. The pre-conditions must be “fixed” – unchanging and the assume statement accomplishes this where the specification addresses the pre-conditions; the post-conditions are the guarantees of the output of the implementation

c. we decided to attach the speed aware module to the existing CAN bus rather than have a dedicated bus. We used “extension” to add to the architecture.

5.

a. List two potential sources of error in our “speed aware” project. How should they be handled?

b. What are the similarities and differences between a viewpoint and a view? (Do not answer by giving the definitions of each. Only differences and similarities.)

c. Service oriented architecture is an architectural style. A well-designed service is stateless and discoverable. What quality attribute is enhanced by having the “Registry” component in the architecture? What system function is made possible by having the “Registry” in the architecture?

a. mechanical sensor error; noise/contention on the bus. Check the data coming from the system for reasonableness. Check for continuity from one reading to the next (0 to 100 mph in one second is an error not a powerful engine)

b. Both address a specific scope of the architecture definition but one is an abstract description while the view is tailored to a specific need.

c. Modifiability and flexibility are enhanced; dynamic reconfiguration is made possible