CpSc 875

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. When components are connected in an AADL model two types of information can flow from one component to another. What are the two types of information? How are they the same and how are they different?

b. There are three standard architectural structures: module, component/connector, and allocation deployment structures. What is the relationship between the module structure and the allocation structure?

c. List two quality attributes that are important to the dynamic view of the software architecture of a product. Explain why each is important.

a. nominal and error; they are both strongly typed and intended to be of use to the destination component; they refer to different segments of the product and follow different flows
b. each module structure is used to create the components that are allocated to specific parts of the target system
c. latency – represents how rapidly information flows; security – how protected the components are from outside manipulation

2.

a. The definition of an AADL entity such as a process or system is divided into two parts: spec and impl. What information is included in each? Why is it important to separate that information?

b. ADD is a process for creating an architecture based on the importance of quality attributes. How are the priorities among quality attributes determined? How are those priorities represented?

c. The pipe and filter architecture routes data from one filter to another through a communication mechanism. Each filter is a transformation. List at least two constraints to which the transforms must conform no matter what the domain.

a. The spec includes definitions and declarations important to the user of that component while the impl provides the logic and supporting entities to use the inputs and produce the outputs; separating allows supporting of multiple impls with varying properties
b. The QAW provides a forum in which the attributes are discussed and then voted on; the utility tree lists them in priority order
c. The transform must consume information in the form produced by its upstream filter and must produce information in the form expected by its downstream filter

3.

a. Model/View/Controller is useful for interfacing users to the system because it is flexible. What parts of the dynamic architecture make it **flexible** at runtime?

b. Availability is the probability a system will execute upon request. Describe one tactic for making a system more available.

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 "encapsulate" tactic is applied and what is unchanged.

a. The fact that an unspecified number of views and controllers may add themselves to the system
b. Redundancy
c. The components that interfaced with a set of components now interfaces with a single new coomponent

4.

a. List at least two specific design actions that can be applied to a reference architecture to derive a product-specific architecture?

b. For the pacemaker project list 2 error sources. For each error source describe how the error will be propagated or mitigated.?

c. A design decision results in the selection of a tactic to apply. Describe one design decision you have made in creating your pacemaker design model.

a. Abstraction/instantiation and refinement
b. Low battery and radiation interference; change battery/ remove radiation source
c. A variety of answers are possible; the decision to assign a subprogram to a specific thread is a design decision

5.

a. A layered architecture structures a design from least abstraction to most with respect to some base abstraction. Typically a project limits dependencies to either running up or down the layers but not both. What desirable characteristics are degraded by allowing two way dependencies?

b. What are the similarities and differences between the system modes in core AADL, the state machines in the behavioral annex, and the state machines in the error annex?

c. Service oriented architecture is an architectural style. A well-designed service is stateless and discoverable. What are the factors that make service discoverablity desirable? What factors make it undesirable? Why is being stateless desirable?

a. Portability – the ability to take a portion of the architecture and use it in another setting
b. The main difference is the scope of impact; the main similarity is the finite state machine construct in which the control structure of a portion of the product is simplified by adopting a set structure
c. Being able to discover leaves flexibility thru late binding; it can cause errors if there is nothing found during discovery; stateless means prior invocations of the element do not influence the current invocation