

# CpSc 372

## Final Exam

Name \_\_\_\_\_

Answer any FOUR of the five questions. Place a large X on the question you are omitting. If you answer all five, the one on which you score the best will be dropped. All questions are counted the same: 25 points each. Answer all parts of each question. By signing your name below you acknowledge that you have neither given nor received help on this exam by any means other than those described to you. You are not allowed to browse the internet nor are you allowed to send/receive any email.

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signature

## 1. Modeling

- a. Three criteria for a good model are: complete, consistent, and correct. What does it mean for a use case diagram to be complete, correct and consistent?
- b. We have used the state diagram of the UML modeling language to model the phases of a traffic intersection. How can we use that model to ensure that the green light is not lit for all directions at the same time?
- c. We looked at the sequence diagram as supplementing the use case diagram. How does it do that? In other words, what information is in a sequence diagram that is not in a use case?
- d. What is the correspondence between the parts of a sequence diagram and a class diagram.

A - A use case diagram should include all of the actors within the given scope and for each actor it should capture every interaction the actor has with the system

-These use case scenarios should show the acceptable interactions and the acceptable results.

- No use case within the scope should contradict another use case

B – By not defining a state in which they are all green and by stating a constraint that indicates this is an error

C- The sequence diagram captures the scenario of a use case in greater detail

D-Every life line in a sequence diagram is an object and that object is the instantiation of a class in the class diagram, every arrow between life lines is a message and the target object of that arrow must be from a class that defines a method of the same name and parameters

## 2. Design decisions

- a. Describe two design tactics that make a design less complex. Compare them with respect to the qualities they effect.
- b. How do pre/post-conditions contribute to our error handling strategy?
- c. What can we measure to evaluate the “goodness” of a design?
- d. The Liskov principle states: *If for each object o1 of type S there is an object o2 of type T such that for all programs P defined in terms of T, the behavior of P is unchanged when o1 is substituted for o2 then S is a subtype of T.*  
Describe how this is implemented in a design. Which qualities are enhanced?

A – decomposition and abstraction – both degrade performance, abstraction enhances reusability and decomposition enhances reusability and correctness

B- pre/post-conditions state exactly what are considered to be errors and defines whom (caller or callee) should handle the errors

C-By the degree to which it achieves the quality attributes levels required

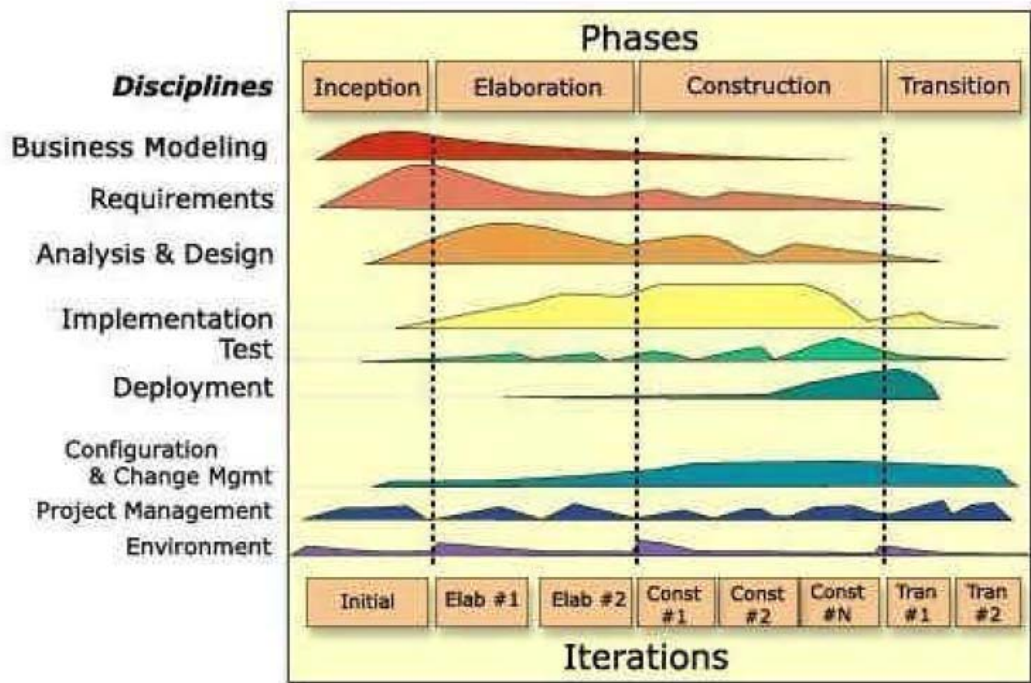
D-Usually implemented using inheritance – extensibility and maintainability are enhanced

### 3. Requirements

- a. Agile projects use time boxing. How is that enforced? How does this help them “welcome” new requirements late in the development cycle?
  - b. The architecture is the design of a solution that supposedly satisfies the requirements. How do we validate the architecture?
  - c. In a software product line we have two levels of models: product line and product. The product line model covers the entire product line and has variation points at places that need to change from one product to the next. In a product line of traffic signal control products what would be different from one product to another?
  - d. Requirements are used all along the development life cycle. How are requirements used during system validation?
- A- Rather than redoing something that is “finished” it is thought of as revising an evolving product
- B- ATAM is a process for comparing a set of scenarios that describe the required system to the proposed architecture. The team evaluates what quality levels will be achieved in executing those scenarios
- C- The number of lanes, the number of turn lanes, whether there is a pedestrian cross walk, ...
- D- The requirements are used by an independent team to create system test cases. These cases are executed to see whether the system does what it is supposed to do.

4. Process Modeling

- a. We talked about several process models: waterfall; iterative, incremental; agile; and others. List at least three factors that vary among these models.
- b. The picture of RUP shows phases on the horizontal axis, and disciplines on the vertical axis. What is the relationship between the vertical and horizontal axes? How is that relationship represented?
- c. The SPEM standard identifies Roles, Tasks, Workproducts, and Guidance as the fundamental elements for a process. Take one phase of the RUP and give examples for each of the four SPEM categories for that phase.
- d. Explain how the Role you selected in (c) above contributes to the success of the development of a product.



- A – the criteria for being a successful project, the algorithm by which time is divided among tasks, and what the tasks are
- B- The relationship is the amount of effort for each discipline in each phase. It is shown by the height of the curve
- C- During Elaboration the Role of Architect will undertake the architecting task, producing a workproduct that is the product architecture, and (s)he will review a least on architecture pattern description for guidance on how to design the architecture
- D-The architect ensures that the pieces that are implemented will fit together and produce the correct result.

## 5. Architecture

- a. The quality attributes we chose for our traffic signal project gave a basis for making design decisions. Describe one design choice that you made based on one of the high priority quality attributes. What were the alternatives that you considered in addition to the design you chose?
- b. We use scenarios in the elicitation of requirements and for the evaluation of a design. What is the same about these two types of scenarios and what is different? (Note – defining each type does NOT answer what is different.)
- c. With every design decision we make we have an accompanying risk that we have made a wrong decision. What actions do we take in our development process to mitigate that risk?
- d. When is it appropriate to use the layered architecture style? Which qualities does the style enhance and which does it degrade?

A-For safety we used a state pattern that has a few well-defined transitions making errors easier to detect.

B-Requirements scenarios focus on functionality while design scenarios focus on qualities

C-We use reviews of all workproducts as the project progresses rather than waiting until the end.

D-When there is a relatively well defined set of categories of functions that have a relatively stable set of dependencies that can be ordered.