

## C8-R3: ADVANCED SOFTWARE ENGINEERING

**NOTE:**

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

**Time: 3 Hours**

**Total Marks: 100**

**1.**

- a) What criteria would you use to distinguish between a good and bad software design?
- b) Distinguish between software validation and software verification.
- c) Explain the meaning of a design pattern? What are the design pattern specification components?
- d) What are the goals of object oriented metrics? Distinguish the characteristics of object-oriented metrics.
- e) For a good architectural design, what are the steps/guidelines recommended at process and product (structural) level?
- f) What is regression testing? Why is it necessary to do regression testing?
- g) What do you understand by software reliability? How is it related to software availability?

**(7x4)**

**2.**

- a) What is component based software engineering (CBSE)? CBSE encompasses two parallel engineering activities: domain engineering and component-based development. Explain any one of them.
- b) Make a checklist of architectural design assessment questions to assess the architecture of any software system. Explain the various architecture styles that can be adopted while designing the software system.
- c) What do you understand by requirement analysis? How is it different from software requirement elicitation? Explain in brief, Facilitated Action Specification Techniques (FAST) and Quality Function Deployment (QFD) with respect to requirement elicitation.

**(6+6+6)**

**3.**

- a) What are the different levels of testing? What are the goals of each level? For each level, specify which of the testing approaches (functional, structural or some other) is more suitable.
- b) What is the difference between white and black box testing? Is determining test cases easier in black or white box testing? Is it correct to claim that if white box testing is done properly, it will achieve close to 100% path coverage?
- c) While designing a data centric software system, what data design principles are used?

**(8+6+4)**

**4.**

- a) When are formal methods used for specifying the software systems? What are the weaknesses of non formal approaches? How are formal specifications of the software requirements written?
- b) Draw the use case diagram for Time and Resource Management System (Write necessary assumptions before drawing the use case diagram).
- c) Agents and multi agent systems are virtually everywhere. Give examples of components that can be modeled (and observed) in terms of agents and example of software systems that can be modeled as multi-agent systems.

**(6+8+4)**

**5.**

- a) Consider the example of modeling the objects in Simple Filing System:
- Every object in the filing system has a name, a date modified, and set of permissions (read, write, execute).
  - Some objects, known as directory objects, are containers of any kind of object in the filing system. Other objects, known as file objects, do not contain other filing system objects.
  - Objects cannot be shared among containers.
  - A directory object allows addition, deletion and listing of any of its contents.
  - A file object has a size (in bytes) and a file type associated with it (e.g., text file, executable file,...) as well as an open method. For a text file, the open method should launch a text editor; for an executable file, the open method should launch the executable.
- Draw the class diagram and instance diagram for the above example.
- b) How equivalence class partitioning and boundary value analysis are different from each other? Are they used in functional or nonfunctional testing?
- c) List the various object-oriented testing metrics.

**(8+6+4)**

**6.**

- a) Explain the term system re-engineering. When should the system be re-engineered? What are the advantages of re-engineering the system?
- b) Derive a set of test cases for the following components:
- i) a sorting routine which sorts arrays of integers
  - ii) an abstract data type which provides operations on character strings. These include concatenation, length of the string and sub-string selection.
- c) Which are the generic software engineering phases? Explain briefly the umbrella activities involved in the software development process.

**(6+8+4)**

**7.**

- a) What are the different object oriented design layers? Briefly explain the unified approach to object oriented design and the object oriented system design process.
- b) What are the generic components of Object Oriented Analysis Model? Explain Class-Responsibility-Collaborator (CRC) Modeling? What are the criteria for the inclusion of a Class on a CRC Card?
- c) With examples, explain, how, instance diagram is represented in UML and useful in the design of object oriented systems.

**(8+6+4)**