

## National Exams December 2014

### 04-Soft-A3, Software Design

3 hours duration

#### **NOTES:**

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is an OPEN BOOK EXAM.  
Any non-communicating calculator is permitted.
3. SIX (6) questions constitute a complete exam paper.  
The first five questions as they appear in the answer book will be marked.
4. Each question is of equal value.
5. Most questions require an answer in essay format. Clarity and organization of the answer are important.

1.
  - a. What artifacts the software design stage produces? Use an example to explain the answer.
  - b. Describe the place of requirements analysis in the software engineering process, and how requirements analysis affects design.
  - c. How artifacts produced from the software design are used in software development process. Use an example to explain your answer.
  
2.
  - a. Describe the relationship between quality of a software system produced during software design and the non-functional requirements of the system.
  - b. Among the following two software design quality attributes, which one can be evaluated by executing the designed system, and which one cannot be evaluated by executing the designed system:
    - Correctness
    - Maintainability
  - c. Among the software design quality attributes listed above, find whether these attributes conflict each other or not. Use examples to explain your answer.
  
3.
  - a. MVC (Model-View-Controller) is a common software design pattern for GUI based software systems. Explain how the software design principle “separate of concerns” is used in MVC.
  - b. What are typical abstractions in function-oriented software design such as using C programming language? What are typical abstractions in object-oriented software design such as using Java or C++ programming languages?
  - c. In software design, what is information hiding? Why information hiding is important? What software design quality attributes benefit from information hiding?
  
4.
  - a. Describe the role of software architecture in the software engineering process: requirements analysis, system an object design, implementation, and testing.
  - b. A software architecture consists of multiple structures, which are composed of software components, behaviors or properties of components, and relationships or interactions between components. Draw two diagrams of a software system, such as client-server system, with each diagram showing a different structure of the same system.
  - c. Architecture of any software system always has two views: structural view and behavioral view. What is the difference between these two views? Use an example to explain your answer.

5.
  - a. What is the concept of modularity of a software system? Why modularity is important in software design? What software design quality attributes does modularity support? What is coupling and cohesion?
  - b. What are modules in function-oriented software systems? What are modules in object-oriented software systems?
  - c. What is decomposition in software design? What is the relationship between software decomposition and quality attributes? Use an example to explain your answer.
  
6.
  - a. What is the structure diagram in function-oriented design? Draw a simple 3-level structure diagram.
  - b. In function-oriented design, there are mainly three purposes to decompose software into multiple functions: reuse, abstraction, and modularity. Use an example to explain each of the purposes.
  - c. In function-oriented design, what is the relationship between functions and data structures? Describe two or more ways for multiple functions to share a data structure.

Marking Scheme

1.
  - a. 3 marks
  - b. 3 marks
  - c. 4 marks
  
2.
  - a. 3 marks
  - b. 3 marks
  - c. 4 marks
  
3.
  - a. 4 marks
  - b. 3 marks
  - c. 3 marks
  
4.
  - a. 3 marks
  - b. 4 marks
  - c. 3 marks
  
5.
  - a. 3 marks
  - b. 3 marks
  - c. 4 marks
  
6.
  - a. 3 marks
  - b. 4 marks
  - c. 3 marks