Comprehensive Exam Fall 2010

Software Engineering

Friday October 22, 2010, 10:00 am – 11:30 am

Instructions

Write the last four digits of your student identification number in the space below.

Answer any four (4) of the six (6) questions. Each question has equal value.

When a question asks you to “describe”, “discuss”, or “explain” something, it means you must provide a convincing, clear, and reasonable answer; simply stating a fact without any supporting argument is insufficient.

No study aids (notes, books, etc.) are permitted during the exam

Good luck!

ID Number: ________________________________
The first four questions of examination are organized around the following requirement specification:

The mFerio is a secure peer-to-peer digital wallet that is integrated into an existing mobile device such as a cell phone. mFerio permits users to manage multiple monetary and ID instruments and quickly search them by name, type, or other keywords. mFerio enhances security as all data would be encrypted; backup options would make recovering from loss or theft easier.

**Design.** Consider the 6 following usability criteria: Fast to use; Easy to use; Easy to learn; Predictable performance; Accurate; Available. From a design and systems engineering perspective, rank these criteria in order of importance to the mFerio project and justify your ranking.

**Management:** In the mFerio system the following security risks must be managed: Anonymity of transaction (like cash); Transaction integrity (e.g., interrupting a transaction will cancel entire transaction); Replication (counterfeiting); Tamper proof (cannot break into system); Theft resistance (unlike cash).

From a security management perspective, rank these risks in order of importance; then for the two most important security risks you have determined, outline an accompanying mitigation strategy.

**Process:** Select a process model for an implementation of the mFerio system. Justify your choice in two ways: reasons for selecting the process model and reasons for not selecting one other process model.

**Requirements.** The specification confuses functional and non-functional requirements.

a. Identify the functional and non-functional requirements.

b. For one of the functional requirements and one of the non-functional requirements that you extract, write a specification using structured natural language or a design description language.
Construction/Maintenance: (nothing to do with mFerio).

Given three sorted lists of integers as file input, write a one-pass algorithm that produces one sorted file of output, where the output is the sorted merger of the three input files. Use any high-level programming language that you wish. Pseudo-code is not acceptable.

Suppose the specification is relaxed to permit unsorted file input, in which case the program will abort with a suitable error message; otherwise the program will function as specified. Outline the changes that you would make to your implementation.

Testing/Maintenance: (nothing to do with mFerio).

Given three sorted lists of integers as file input, a program is to produce one sorted file of output, where the output is the sorted merger of the three input files.

a. Outline a comprehensive strategy for this program. Justify your thinking.

b. Suppose the specification is relaxed to permit unsorted file input, in which case the program will abort with a suitable error message; otherwise the program will function as specified. What changes must be made to the test strategy of part (a)?