

COMP/EECE 7012  
**Midterm Exam**  
Spring 2012

Name: Answer Key

**Instructions:**

- No bathroom breaks.
- No calculators.
- No cellphones—turn them off.
- No other devices.
  
- Closed book.
- Closed note.
- Closed neighbor.
  
- Verify that you have all the pages.
- Don't forget to write your name.
- Read each question carefully.
- Don't forget to answer every question.

For each of the following, circle the answer that best answers the question.

1. [3pts] Which of the following is not a problem in software engineering?
  1. Gathering complete and valid requirements
  2. Estimating the cost of a software project
  3. Removing defects from software
  4. Maintaining software over time
  5. None of the above (i.e., all are problems)
  
2. [3pts] Why is the waterfall model of software engineering considered a bad practice?
  1. Because testing should come before implementation
  2. Because it's based on the assumption that design and implementation are the same activity
  3. Because it says that developers cannot revisit activities from earlier the lifecycle to correct defects discovered during the later phases
  4. Because it's based on the assumption that requirements are stable and can be correctly defined at the start
  5. None of the above
  
3. [3pts] How long should a development iteration be?
  1. 1-2 days
  2. 2-6 weeks
  3. 4-6 months
  4. 6-12 months
  5. > 1 year
  
4. [3pts] According to experienced analysts and modelers, what is the "secret of modeling"?
  1. The purpose of modeling is primarily to understand, not to document
  2. The purpose of modeling is primarily to document, not to understand
  3. You can never model enough
  4. Use UML; it's the best
  5. Box-and-line diagrams are easier to understand than textual specifications
  
5. [3pts] Which of the following is not an agile value?
  1. Individuals and interactions over processes and tools
  2. Working software over comprehensive documentation
  3. Customer collaboration over contract negotiation
  4. Responding to change over following a plan
  5. None of the above (i.e., all are agile values)

6. [3pts] Which of the following problems does iterative development directly address?
1. Design erosion
  2. Unstable requirements
  3. Program comprehension
  4. All of the above
  5. None of the above
7. [3pts] Requirements activities are primarily concerned with answering which of the following questions?
1. What system should we build
  2. How should we build the system
  3. When will the system be built
  4. Why should we build the system
  5. None of the above
8. [3pts] Design activities are primarily concerned with answering which of the following questions?
1. What system should we build
  2. How should we build the system
  3. When will the system be built
  4. Why should we build the system
  5. None of the above
9. [3pts] What is the purpose of analysis in software development?
1. Bridge the gap between requirements and design
  2. Improve understanding of the problem domain
  3. Suggest possible objects to go in the software design
  4. All of the above
  5. None of the above
10. [3pts] Which type of process control model is appropriate for software development?
1. A "defined" process control model
  2. An "empirical" process control model
  3. A "remote" process control model
  4. A "parallel" process control model
  5. None of the above

For each of the following requirements specifications, give the type of the requirement with respect to the FURPS+ classification. Write the name of the requirement type (e.g., "functional").

11. [3pts] The text in menus and toolbars must be in at least a 10pt font, so it is readable to the user.

Usability

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12. [3pts] A spreadsheet must use no more than 50 MB of memory at a time, regardless of how large the spreadsheet is.

Performance

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13. [3pts] The document editor must be able to run continuously for one week without crashing.

Reliability

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14. [10pts] The following "brief" use case for an ATM system violates two of the style guidelines we discussed in class. Tell what the two guidelines are, and give examples of how each is violated.

#### **UC WithdrawCash**

The Customer arrives at the automated teller wanting to withdraw cash. The Customer inserts her card into the machine. The System runs an SQL query on the account database to get the Customer's pin number. The System prompts the Customer for her pin number. The Customer enters her pin number into the graphical form field and then presses the "Done" button. The System validates the pin that the customer entered. The System presents the Customer with a variety of "quick cash" options. The Customer clicks the "\$20" button. The System runs an SQL query on the database to check that the Customer has enough available funds, and then updates the database to reflect the withdrawal. The teller machine dispenses the cash, ejects the Customer's card, and displays the welcome screen.

Essential (UI Free) style: The UC talks about specific UI elements, such as "graphical form field" and "'Done' button". This violates the essential style.

Black-Box style: The UC talks about implementation details of the system, such as SQL queries. This violates black-box style.

15. [10pts] Consider the following main success scenario of a "fully dressed" use case for a flight reservation system.

**UC BookFlight**

1. The Traveler requests a listing of available flights, providing the criteria: source airport, destination airport, preferred departure time, and maximum number of connections.
2. Based on the criteria, the System returns a list of available flights.
3. The Traveler requests to book one of the flights, providing his identification information and payment information.
4. The System confirms the flight's availability, processes the payment, and records the reservation.
5. The system provides the Traveler with a confirmation number for the booking.

Write one alternative flow that covers the situation where the Traveler's payment is invalid. The alternative flow should give the Traveler the opportunity to enter valid payment information.

4a. Payment invalid.

1. The System reports that the payment information was invalid and requests updated payment info from the Traveler.

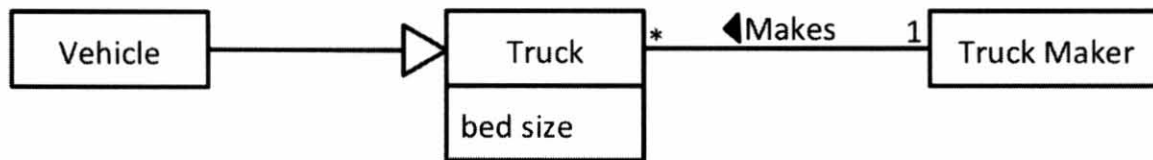
2. The Traveler provides updated payment info.

3. The System validates the payment info.

If the payment info is invalid, repeat steps 4a.1 - 4a.3.

4. The System confirms the flight's availability, processes the payment, and records the reservation.

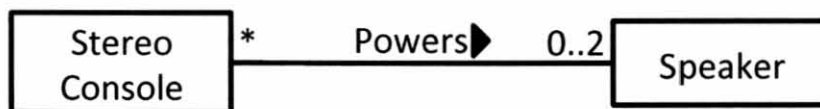
16. [6pts] Does the following class diagram comply with the “100% Rule” and the “Is-a Rule”? For each rule, explain how the diagram does or does not comply.



100% Rule: No. A Vehicle does not necessarily have a bed size, nor is it necessarily made by a Truck Maker.

Is-a Rule: No. All members of the subclass set Vehicle are not members of the superclass set Truck. For example, a motorcycle is a vehicle, but is not a Truck.

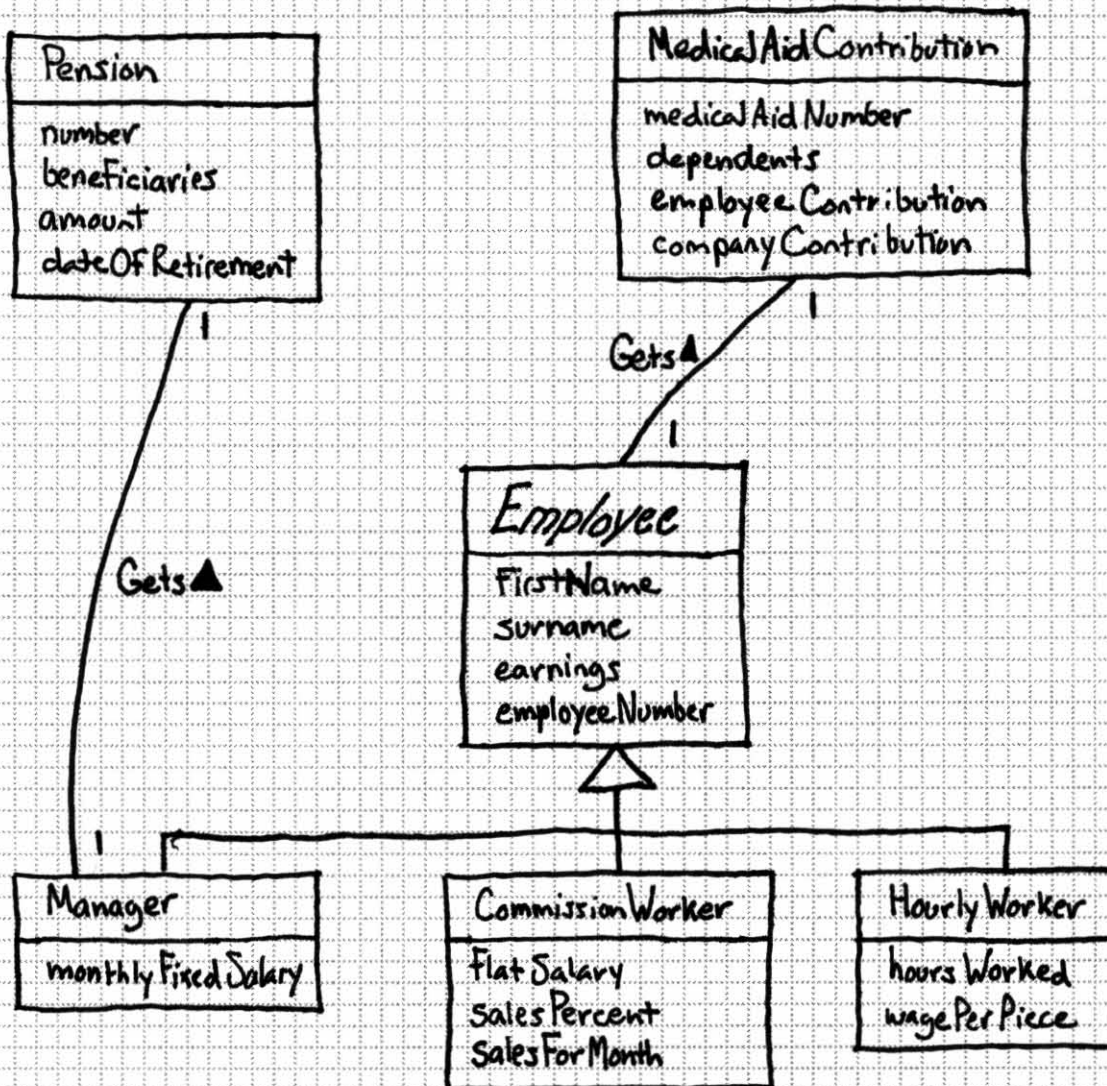
17. [3pts] Which of the following statements correctly expresses the semantics of following class diagram?



1. A stereo console powers between 0 and 2 speakers
2. A speaker is powered by 0 or more stereo consoles
3. A stereo console powers 0 or more speakers
4. A speaker is powered by between 0 and 2 stereo consoles
5. Both a and b
6. Both c and d
7. a, b, c, and d
8. None of the above

18. [16pts] Create a domain model in the form of a class diagram based on the following description. Model only things that are specifically described. Do not model "the system."

A company requires a payroll system. The company has three types of employees, namely, a manager, a commission worker, and an hourly worker. Information that needs to be stored for each employee is the employee's first name, surname, earnings and employee number. Additional information that must be stored for a manager is his/her monthly fixed salary; for a commission worker his/her flat salary, sales percent and the sales made for the month; for an hourly worker the number of hours worked and the wage per piece. All employees get a medical aid contribution. In addition to this managers get a pension as a fringe benefit. Each medical aid instance specifies the medical aid number, dependents, employee contribution and company contribution. while each pension instance specifies the pension number, beneficiaries, amount and date of retirement.





19. [16pts] Draw a System Sequence Diagram based on the main success scenario from question 15.

