SEG 2100
Software Design II

MIDTERM – Tuesday Oct 26, 1999

Length of Examination: 70 minutes

Worth 10% or 15% of the course

Professor: Timothy C. Lethbridge

Family Name: _____

Other Names: _____

Student Number: _____

Closed book.

Good luck!

Part A: Multiple Choice	_____ / 40
Part B: Fill in Blanks	_____ / 20
Part C: Diagrams	_____ / 40
TOTAL	_____ / 100

Part A: Questions 1-10. Multiple choice. (4 marks each)

Circle the single best answer to each question. There is **only one best answer** for each question. Part marks *may* be given for answers which are good but not the best.

1. Which of the following three statements is **false** in a good design?
   a) A class at a **leaf** in the inheritance hierarchy **must** be **concrete**
   b) A class at a **non-leaf** in the inheritance hierarchy **can** be **concrete**
   c) A class at a **non-leaf** in the inheritance hierarchy **must** be **abstract**
   d) **Two** of the above are false..
   e) **All** of the above are false.
   f) **None** of the above is false.

2. In Java, Observable is:
   a) A keyword which indicates that a variable can be accessed from outside the package.
   b) A Java keyword which indicates that when a certain variable changes, a certain method is to be automatically called.
   c) A class whose instances are notified whenever some other Observer instance changes.
   d) A class whose instances each notify their list of Observers when they change.
   e) An interface whose instances are notified whenever some other Observer instance changes.
   f) An interface whose instances notify a list of Observers when they change.

3. What method in a subclass of Server would you need to modify in order to allow the server to be able to deal with a new message coming over the network from an existing connection?
   a) handleMessageFromServer()
   b) handleMessageFromClient()
   c) handleMessageFromClientUI()
   d) handleMessageFromServerUI()
   e) sendToAllClients()
   f) acceptNewConnection()

4. Imagine you want to model a hierarchy with you at one level, your mother and father at a second level, your grandparents at a third level, etc. You would model this using:
   a) An aggregation hierarchy
   b) A generalization hierarchy
   c) A class hierarchy
   d) An inheritance hierarchy
   e) More than one of the above
   f) None of the above

5. Imagine you are having trouble creating a class diagram, so you decide to follow a systematic approach. Which of the following types of information would you plan to add to the diagram **last**?
   a) Classes
   b) Inheritance
   c) Multiplicity
   d) Attributes
   e) Associations
   f) Aggregation

6. The main difference between a ServerSocket and a regular Socket is:
   a) A ServerSocket waits for new connections from clients.
   b) A regular Socket accepts new connections from clients.
   c) There are many ServerSockets in the server, but only one regular Socket.
   d) A ServerSocket represents one end of a connection; there are therefore two per connection.
   e) A ServerSocket is created whenever a client connects.
   f) None of the above.

7. Class ClientUIPhase1 is made to implement Observer primarily so that we can adhere to which design principle:
   a) Use a client-server architecture whenever possible.
   b) Separate the user interface layer from the functional layer
   c) Reuse code whenever possible
   d) Use concurrent threads whenever you have a system that must respond to many different kinds of events in any sequence
   e) Sets of classes that work together should be in packages

8. An interface in Java:
   a) Is a special kind of class that contains only public methods
   b) Contains only instance variables
   c) Contains only implementations of methods
   d) Contains only methods that have no implementations
   e) Is a special kind of method that has no implementation

9. If I have an abstract method in a class, then:
   a) The class must be concrete
   b) I must create a concrete method with the same name in subclasses
   c) The class must be abstract
   d) All subclasses must be concrete
   e) All subclasses must be abstract
   f) More than one of the above

10. In Java, a class whose instances can run as independent threads can be created by:
   a) Implementing the interface Runnable
   b) Creating a subclass of class Runnable
   c) Creating an instance of interface Thread
   d) None of the above
   e) More than one of the above

Part B: Questions 11-15. Fill in the following blanks. (4 marks each)

11. What keyword do you use in Java to specify that a class is not allowed to have any subclasses?

    _____

12. What keyword in Java to you use to specify that a method can be called from code outside the current package?

    _____

13. Which protocol is used to manage connections between clients and servers over the Internet?

    _____

14. Each server should have threads for the following: Responding to messages from connected clients, communicating with the user, and:

    _____

15. If you want to specify that an variable will have just one value shared by the entire class (as opposed to each instance), then you declare the variable in Java using the following keyword:

    _____

    Such a variable is called a _____ variable.
    (note: Both blanks should be filled in differently)

Part C: UML Class Diagrams (40 Marks)

You are running a small home-maintenance business. You do several types of jobs:
• Roof repairs (you need information about the type of roof and the area)
• Window replacement (you need to store a list of windows, each of which has a model and dimensions)
• Painting (you need to know the type of paint, colour, and square meters)
• Installation of siding (you need to know the type, colour and square meters)

The system needs to store customer information, the planned start and end date of each job and the employees assigned to do the job.

The system also needs to keep information about the *types* of job, including the standard labor rate for each type. For example: Roof repairs for a flat roof would cost $25 per square meter.

12. Draw a diagram showing the inheritance hierarchy and attributes associated with the jobs. (15 marks)

13. Add a class Window and connect it to your diagram using associations and attributes (5 marks)

14. Add a *player-role* pattern for the different types of people and connect this to your diagram (don't forget any appropriate attributes) (15 marks)

15. Add an *abstraction-occurrence* pattern to account for the types of job (don't forget any appropriate attributes) (5 marks)

(You may do rough work on the back, but put your final answers neatly below as one diagram)