Final Exam
CSE403 Spring 2007

NAME: ______________________________

Question #	Value	Score
1	5	
2	5	
3	8	
4	5	
5	2	
6	4	
7	3	
8	5	
9	5	
10	3	
11	5	
12	3	
13	5	
TOTAL:	58	

Instructions:

– Do not turn this page until instructed to do so.
– The exam is open book, open notes, closed laptops and other digital devices.
– Write legibly. Answer as clearly and concisely as possible.
– As well as completeness, you will be graded on the quality of your answers. Provide reasonable support, including facts, references, and specific examples or diagrams when applicable.
– If you need additional space for any question, use the last page. Clearly identify the question to which the answer applies.

Q1 (5pts): Suggest the most appropriate software development model that might be used as a basis for managing the development of the following systems. Provide justification for your answer based on the properties of the model and the type of system being developed.

a. A system to control anti-lock braking in a car

b. A hospital accounting system that replaces an existing system

c. An interactive system that allows airline passengers to quickly find replacement flight times (for missed or bumped reservations) from terminals installed at airports

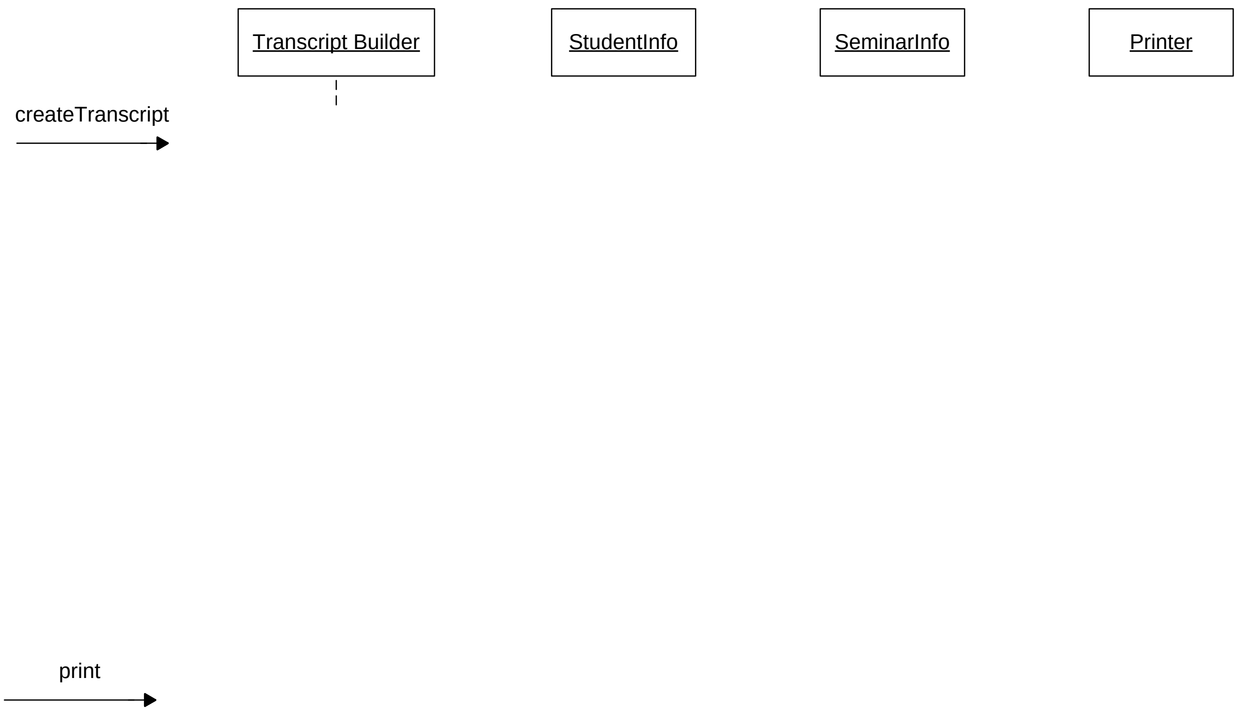
Q2 (5pts): A hotel reservation system allows customers to book rooms online. Create a formal use case for the scenario of a customer booking a room for a specific date and duration. The hotel offers rooms of various sizes, with availability based on the dates, which the customer will also need to identify. Include all the applicable elements of formal use cases that we have discussed in class and used in your SRS.

Q3 (8 pts): CSRocks Inc. would like to create a simulation of a new kind of MP3 player, the "Upod", for evaluation. Using good design principles as discussed in class, create a high level UML class diagram to show the relationships between the various components of the UPod. The MP3 player must contain at a minimum the following:

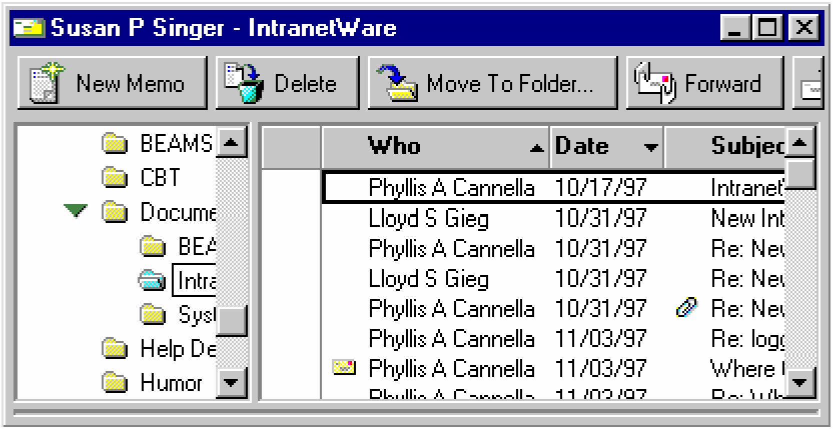
1) An external port for connecting to accessories, such as headphones
2) A hard drive or flash memory for holding songs and videos
3) An LCD display for showing song titles and videos
4) A set of input buttons (such as play, stop, skip), that allow the user to interact with the MP3 player
5) An internal CPU to compute requests

Your diagram should show all relevant UML classes and relationships between the classes with appropriate UML adornments. You do not need to indicate the attributes or method items. You may add UML comments to your diagram if necessary for clarification.

Q4 (5pts): Create a UML sequence diagram to represent a system, TranscriptBuilder, which creates student transcripts. The system must get a list of the student's seminars from the StudentInfo module, and then for each seminar, get the grade for that student. The grade is computed from the SeminarInfo module. Once the transcript is returned to the student, the student issues a command to the TranscriptBuilder to print it without requiring a notice of completion.



Q5 (2 pts): What is the major problem with this interface? How would you fix it? Draw the fix.



Who	Date	Subjec
Phyllis A Cannella	10/17/97	Intranet
Lloyd S Gieg	10/31/97	New Int
Phyllis A Cannella	10/31/97	Re: New
Lloyd S Gieg	10/31/97	Re: New
Phyllis A Cannella	10/31/97	Re: New
Phyllis A Cannella	11/03/97	Re: logg
Phyllis A Cannella	11/03/97	Where I
Phyllis A Cannella	11/03/97	Re: Wh

Q6 (4pts): Draw a UI for a library search that has the following features:

- ability to enter a search string as an author, title, or subject
- ability to search magazines and/or books
- ability to display multiple results, and to order them by either availability or earliest date of publication (but not both)

You should use the most appropriate UI component (button,pulldown,checkbox,scrollbar, etc) for each feature, identifying the type of component it is, if it is not obvious.

Q7 (3pts): From a design perspective, would it be appropriate to implement a class House via inheritance from class Building in order to reuse the implementation of the many useful methods already defined in Building even if Building has other methods that have no meaning in the context of House? Justify your answer using the design concepts discussed in class.

Q8 (5 pts): Write a ParkFactory class using the Factory design pattern, which creates a park in a SimCity game. Each park is associated with a city. The factory should add the park to the city layout, register its size with the layout, and record its availability with the city hall. Assume there exists a Park, City, CityLayout, and CityHall class with appropriate supporting methods (that you can define).

Q9 (5 pts): Write a set of unit tests for the following Circle class.

```
class Circle
{
   private:
     int xcenter;         // x location on graph
     int ycenter;         // y location on graph
     double radius;    // radius of circle
     static double PI; // 3.14159…

   public:
     Circle(int x, int y, double r);     // constructor
     double get_radius() const;      // accessor
     void set_radius( double r );     // mutator

     void setCircle(int x, int y, double r);  // reset attributes
     double area();                                  // return area (pi*r*r)
     double circumference();                   // return circumference (pi*2r)
};
```

Q10 (3 pts): Name three aspects of Bugzilla that make it a better bug tracking tool than an excel spreadsheet with similar fields. Explain your answer.

Q11 (5 pts): CSRocks Inc., a for-profit company, would like to use a new numerical library in their RayTracing product. They would like to start with a readily available base library and then enhance the library to be extremely fast. Their choice is to start with either the GFreeLib, which is “free software” licensed under the GNU GPL, or the OSourceLib, which is “open source software” licensed under the MIT license.

a. What are the ramifications of starting with GFreeLib? Of starting with OSourceLib?
b. Which would you recommend to CSRocks and why?

Q12 (3 pts) Doug Johnson, Boeing supervisor, talked in class about connecting a number of components together to form the overall 787 software system. What development technique does Boeing use to make the integration stage as smooth as possible when it occurs? Would this technique have made it easier to connect the components of your project?

Q13 (5 pts): Circle the aspects of the following code segment that need to be refactored. For each, briefly state the refactoring you would make to improve the situation. Redraft the code in its refactored form.

```
public class PrimeGenerator {
   private static int s;
   private static boolean[] f;
   private static int[] primes;


   private static int[] generatePrimes(int maxValue) { … }
   private static void initializeSieve(int maxValue) { … }
   private static void loadPrimes() { … }

   private static void sieve() {
      int i;
      int j;
      for (i=2; i<Math.sqrt(s) + 1; i++) {
         if ( f[i] ) {     // if i is uncrossed, cross out its multiples
            for ( j=2*i; j < s; j+=i )
               f[j] = false;  // multiple is not prime
         }
      }
   }
}
```

Space below this point may be used to continue earlier answers. Please clearly label the question to which the answer applies.