ICS 52 - Introduction to Software Engineering
Midterm Exam #2 – Winter, 2007

Last Name: _____ First Name: _____

1. (10 points) Give a definition of the term 'software architecture'. Explain the different elements in this definition.

   See p. 254. 2 points for explaining the elements.

2. (15 points) The modularity of a design can be measured by the criteria of "cohesion" and "coupling".

   Define cohesion, in the context of software modularity.

   See 11.1.2. Each part was worth 5 points.

   Define coupling, in the context of software modularity.

   Is it best to have a lot of cohesion or little cohesion? A lot of coupling or little coupling? Explain your answer.

3. (25 points) Consider the following Java class:

```
public class Midterm2
{
      private long tolerance;

      public Midterm2(long tol)
      {
            tolerance = tol;
      }

      public long compare(long millisSinceJan_1_1970)
      {
            if (millisSinceJan_1_1970 < 0)
                  return 0;
            if (millisSinceJan_1_1970 == 0)
                  return -1;
            Date d1 = new Date(millisSinceJan_1_1970 + tolerance);
            Date today = new Date();   // get curr date and time
            long result;
            if (d1.after(today))
                  result = 19;
            else if (d1.before(today))
                  result = 167;
            else
                  result = -7;
            return result;
      }
}
```

- Number above the lines of the compare method, and draw a control flow graph for that method.

  15 points. Most common error: no line from "result = 19" to "return result"

- Define the set of inputs to the compare method.

  5 pts. The set consists of a long for millisSinceJan_1_1970, a long for tolerance, and a Date object returned by Date(). 2 pts each for any two, 1 pt for the third.

- Write down a set of test cases (give specific values) that guarantees node coverage. You may find it useful to know that today there have been about 1,173,000,000,000 milliseconds since Jan. 1, 1970; that value can be passed to Date's constructor to create an object representing today.

  5 pts. Scored based on answer to previous part.

4. (13 points) Joel Spolsky writes, "Design, for my purposes, is about making tradeoffs." Select two software qualities discussed in lecture or in the textbook (but not "high-quality", "on-time", or "inexpensive"), and describe how in designing the AutoMenu system you might have to trade off one for the other.

   A wide range of answers was accepted.

5. (12 points) In the chapter on Object-oriented Analysis and Design, the textbook says the question "What is an object?" can be answered in different ways, depending on the viewpoint. Match each notion of an "object" with the corresponding viewpoint or level of discussion.

2 pts. for each correct

notion of "object"	viewpoint or level
a conceptual model of the world **modeling**	philosophical
existential abstraction, "everything is an object"**phil**	software engineering
data abstraction, encapsulating data and operations**s.e.**	formal
contiguous structure in memory **implementation**	programming level
state machine with a finite set of states **formal**	modeling
member of a class **programming level**	implementation

6. (25 points) Congratulations! You have just been hired as Software Architect for a new system called Cheater Zapper (CZ). CZ will be used by teachers to determine if papers turned in to them are substantially similar to other papers which have been submitted to CZ. Teachers use CZ by uploading Word, plain text, or PDF files over the Web, or they can fax printed copies to a special phone number. CZ ranks each paper on a 1 to 100 scale, with a higher number indicating greater similarity to a previously submitted document. Select two architectural styles described in the book or in lecture, write down their names, and for each style draw a diagram (*not* a UML class diagram) showing the CZ architecture following that style. Make sure your diagram is clearly labeled and clearly illustrates the selected architectural style.

   Style #1 _____

   13 pts for first, 12 pts for second.

   Style #2 _____