

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.

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.

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.
  
- Define the set of inputs to the compare method.
  
- 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.

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.

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.

notion of "object"

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a conceptual model of the world

existential abstraction, "everything is an object"

data abstraction, encapsulating data and operations

contiguous structure in memory

state machine with a finite set of states

member of a class

viewpoint or level

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philosophical

software engineering

formal

programming level

modeling

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 \_\_\_\_\_

Style #2 \_\_\_\_\_