Instructions: Full credit for clear, concise answers. No need for complete sentences.

1. (6 points) What are two reasons predictive models are imperfect?
   i
   ii

2. (5 points) What is the technical term meaning a predictive model is good enough for your purposes?

3. (5 points) What is the inherent flaw in discrete-time simulations?

(5 points) Given that, how to improve an inaccurate discrete-time simulation?

4. (10 points) Write pseudo-code for the main loop in a discrete event simulation.

5. (10 points) What are 5 elements of good programming style (i.e. software engineering principles)? For each: 1) name it, 2) explain how it reduces cognitive overhead.

   a  1.
       2.
   b  1.
       2.
   c  1.
       2.
   d  1.
       2.
   e  1.
       2.
6. (8 points) In our disk simulation the block size was 8. What were the 4 2-byte fields in the inode?
   i
   ii
   iii
   iv

(5 points) We bought a new disk! With block size 16! Twice as big! Assume the same inode format. How big is the biggest file (in bytes) that can be stored? Show your answer as the a sum of three values, as well as the total.

7. (6 points) In the context of a differential equation simulation with two variables, what is:
   Phase space
   A fixed point

8. (6 points) In the Lotka-Volterra simulation, what were:
   The model:
   The view:
   The controller:

9. (8 points) Write code fragments that will sometimes cause ConcurrentModificationExceptions. Show how to prevent them?
10. (5 points) What are two reasons abstract classes are useful?

i

ii

11. (5 points) What does this print? Explain why, and how to fix it.

```java
public class SuperclassProblem {
    public static void main(String[] args) {
        new Child();
    }
}
abstract class Parent {
    abstract void printListWithStringInFront(String s);
    Parent() {
        printListWithStringInFront("Parent:");
    }
}
class Child extends Parent {
    char[] list = {'x', 'y', 'z', 'z', 'y'};
    Child() {
        super();
        printListWithStringInFront("Child:");
    }
    void printListWithStringInFront(String s) {
        System.out.println("" + s + " " + printListOrNull(list));
    }
    private String printListOrNull(char[] list) {
        if (list == null) {
            return "null!!";
        }
        String returnMe = "";
        for (char ch : list) {
            returnMe += ch;
        }
        return returnMe;
    }
}
```

12. (6 points) Starting with Lab 0 you have been adding a JPanel to a JFrame to create a view. What method did you write in the JPanel to draw your view?

What are 3 things that can go wrong (i.e. that will prevent the drawing you do in that method from appearing on the screen)?

i

ii

iii
13. (15 points) Write a `Controller` class that extends `Thread` for use in a model-view-controller style simulation. Include a running variable, methods `toggleRunning()`, `run()`, `delay()`, and `step()`; and variables `Model` `theModel` and `View` `theView`.

14. (10 points extra credit -- only if written on the back of page 3!) a) Perhaps glaciation (and "snow-ball Earth") are caused by "snow-machine Earth". What is the hypothetical mechanism for that? Refer to the diagram in your explanation.

b) Use your (implicit?) model of global weather to predict how moving towards the "planet as snow machine" state might affect global weather.