First Name: _______________________

Last Name: _______________________ 

Student ID: ________________________ 

Section time ___________ TA: ____________________________

I pledge on my honor that I have not given or received any unauthorized assistance on this examination.

Your signature: _____________________________________________________________

General Rules (Read):

- This exam is closed-book and closed-notes.
- If you have a question, please raise your hand.
- Total point value is 100 points.
- Answer essay questions concisely using 1 or 2 sentences. Longer answers are not necessary and are discouraged.
- WRITE NEATLY. If we cannot understand your answer, we will not grade it (i.e., 0 credit).
Problem 1 Software Development & Testing (20 pts)

a. (4 pts) What is the main reason many software projects fail?
   a. Poorly trained programmers
   b. Insufficient project funding
   c. Complexity of projects
   d. Slow computers
   e. Insufficient computer memory

b. (4 pts) What is the software life cycle?

c. (4 pts) What is the first phase of the software life cycle?
   a. Testing
   b. Coding
   c. Design
   d. Specification
   e. Documentation

d. (4 pts) True or False
   According to the waterfall model…
   a. Design all algorithms before coding
   b. Write test cases before coding
   c. Use prototype implementation to refine design

e. (4 pts) True or False
   According to the unified model…
   a. Design all algorithms before coding
   b. Write test cases before coding
   c. Use prototype implementation to refine design

f. (4 pts) True or False
   Compared to program verification, empirical testing…
   a. Handles larger programs
   b. Always catches more errors
   c. Ensures code is correct
   d. Can be applied without examining code

g. (4 pts) True or False
   a. Black box testing requires good programmers
   b. Code coverage is a measure of code testing
   c. Pre-conditions and post-conditions are used for empirical testing
Problem 2 Object-Oriented Design (20 pts)

h. (4 pts) State and behavior are two main qualities of objects in an object-oriented system.
   a. What is the third quality?
   b. What is it used for?
   c. What is an example of its use in Java?

i. (4 pts) True or False
   Object oriented design…
   a. Produces faster programs
   b. Produces smaller programs
   c. Produces software without errors

j. (4 pts) Abstraction and encapsulation are two principles of object-oriented design
   a. Define abstraction
   b. Define encapsulation
   c. Describe how object-oriented design supports encapsulation

k. (4 pts) Given the following problem description, produce an object-oriented solution. Include as many details as possible. Draw a UML class diagram (you may write code for Java classes ONLY if you don't know UML).

   Design a simulation of a basketball conference. Each conference has 10 teams. Each team has 12 players. Each player has a specific height, speed, and accuracy. Players know which team they belong to. Some players are scholarship players. Scholarship players need to record their current grade-point average. Players may be transferred between teams. Teams play basketball games against other teams in the conference. The result of each game is determined using a function based on the height, strength, speed, and accuracy of the players on each team.
Problem 3 Unified Modeling Language (20 pts)

1. (4 pts) Consider UML
   a. What are class diagrams used for?
   b. What is an association?
   c. What is a dependency?

m. (4 pts) Given the following Java code, draw a UML class diagram (you may write code for Java classes ONLY if you don't know UML).

```java
public class Propeller {
    public double thrust;
    public int mileage;
}

public class Engine {
    public double power;
    public int mileage;
}

public class Plane {
    public Propeller[] myPropellers;
    public Engine myEngine;
}

public class Pilot {
    public int flightHours;
    public void fly(Plane p) {
        ...
    }
}

public class FighterPilot extends Pilot {
    public int rank;
}
```

n. (4 pts) Consider the UML diagram on the right:
   a. Which class contains class D?
   b. Which class uses class D?
   c. Which class may change if class D changes?
   d. How many instances of class D does class F have?
   e. Can class A be used wherever Class C is used?
   f. Can class E be used wherever Class C is used?
Problem 4 Java Programming (25 pts)

o. (4 pts) True or False
   a. Using “==” and .equals() always return the same result
   b. Variables of type Integer and int are both references
   c. Autoboxing creates an Integer object from an int
   d. Exceptions are used to capture run-time errors

p. (4 pts) Write Java code for a Card class
   a. Use an enumerated type for the suits in a card deck (Spades, Hearts, Diamonds, Clubs)
   b. Implement the comparable interface for Card objects so that the suits are ranked in the order listed (Spades > Hearts > Diamonds > Clubs)

q. (4 pts) Write Java code for a Deck class
   a. Uses an ArrayList to store multiple Card objects
   b. Use an anonymous inner class to generate an Iterator over Card objects in the Deck

Problem 5 Graphic User Interfaces (15 pts)

r. (4 pts) In a graphics user interface
   a. What is the model?
   b. What is the view?
   c. What is the controller?
   d. Why should these be kept separate?

s. (4 pts) Event driven programming
   a. What are events?
   b. Why use events for GUIs?
   c. How are events handled in Java Swing?

t. (4 pts) Given Java Swing code for a GUI, understand the different roles of each part