CS 5150, Software Engineering
Sample Test 3

This test was set in a previous year when the tests were 45 minutes. The 2018 tests will be 60 minutes and the questions will be slightly longer.

Instructions

1)   Answer both questions.

2)   Write your answers in an examination book. WRITE YOUR NETID ON THE FRONT OF EACH BOOK.

3)   This is an open book test.   You may use any books or notes.

4)   Laptop computers, tablets, and similar devices may be used (a) to store lecture slides, notes, and other papers, and (b) as a calculator.

5)   You may NOT listen to any audio materials or view the video lectures.

6) NO electronic device may be used for any form of COMMUNICATION, or any activity that involves networking, including email, texting, or searching the web.

The Collision Avoidance System

Both questions refer to the following Collision Avoidance System.

Ship A has two instruments, which provide digital information for navigation:
  (1) A global positioning system (GPS) measures the position and velocity of Ship A.
  (2) A radar set measures the distance and bearing of other ships from Ship A.

The Collision Avoidance System continually receives data from these two instruments.

From the data, a plotting subsystem calculates the track of each other ship relative to Ship A. This is displayed on a screen. If the other ship appears to be on a collision course, the system alerts the crew of the ship.

Question 1: System Design

The goal of Question 1 is to develop the **<u>system design</u>** for the Collision Avoidance System.

(a) Using an appropriate architectural style, divide the Collision Avoidance System into a small number of subsystems. Give a **brief** description of the interfaces between these subsystems.

(b) Draw an *component diagram* showing the system architecture of the Collision Avoidance System.

(c) Instruments sometimes fail or give erroneous data. Where in the system architecture are these errors identified and handled?

Question 2: Program Design

The goal of Question 2 is to develop an **object-oriented program design** for the Collision Avoidance System.

(a) During the lifetime of the Collision Avoidance System it is expected that the radar will be replaced by a different instrument. Probably, this will provide navigation data in a new format through a different interface.

    (i)   How would you incorporate this requirement into the program design?
    (ii) Draw the appropriate UML *class diagram*.

(b) Create a UML *class diagram* for the plotting subsystem as follows.

    (i)   Use noun identification to list the candidate classes.
    (ii)   Select the classes. For each class, list at least one attribute and one operation.
    (iii) Draw a possible *class diagram*.