CENG 211
Final Exam Questions from Previous Years

1. Write WeatherObservation, Road, CityRoads and Simulation classes in Java that keep track of weather conditions of city roads for a period of a month. There are N roads in the city where weather conditions are measured and observed. WeatherObservation class stores measured temperature in Celsius, measured wind in km/h and observed rain condition in True/False. For each day, measurements/observations are made only once for each road and their values are stored in the instances of WeatherObservation class. The CityRoads class is a collection of road instances that exist in the city. Assume that there are 30 days in a month. Write necessary methods for the above classes and make sure that there are methods, which return least windy, least rainy, and least hottest road for a day and also for a month.

2. Write a method in Java that inputs StartPoint and CheckPoint integer values and returns true if the 3N+1 series starting from StartPoint contains CheckPoint or false if it does not contain CheckPoint. For example, if StartPoint is 1 and CheckPoint is 40 then the 3N+1 series will be "1, 4, 13, 40" and the method returns true. If StartPoint is 1 and CheckPoint is 39 then the 3N+1 series will be "1, 4, 13, 40" and the method returns false.

3. Buyers of a product can be categorized as follows: senior if (s)he is 60 or more years old, adult if between 30 and 59, and young if between 18 and 29. Moreover, the following constraints should be satisfied:

   - A buyer should be in age of between 18 and 79.

   - A buyer's working status is represented with 1 for workers, with 2 for students, and with 3 for non-workers.

   - A buyer's gender is represented with F for female and M for male.

   - A buyer's name cannot be longer than 30 characters.

   Design and implement an ADT for BuyerList class, which defines interface for numberOfBuyers(char gender), numberOfBuyers(int workingStatus), numberOfBuyers(String ageCategory) methods. Give UML class diagram and implement necessary interfaces and classes in Java.

4. The Department has a curriculum, which contains (or consists of) one or more courses. A course is composed of zero or more lectures. A course is given by a professor and taken by a number of students. Write a Java program composed of Person, Professor, Student, Curriculum, Course, and Lecture classes that can report student attendance to a lecture (in numbers) and course (in percentage). Design the solution using UML class diagram and code all classes in Java.

5. Write a method in Java that takes two strings as input and returns the intersection of these two strings, with each letter represented at most once. For example, assume that "exam" and "question" strings are passed as arguments, then your method should return "examqustion" string.

6. Write a Java class that keeps track of rings stacked on a peg. The peg may hold up to 64 rings, with each ring having its own diameter. Also, there is a rule that requires each ring to be smaller than any ring underneath it. The class's methods should include: (a) a constructor that places n rings on the peg (where n may be as large as 64). These n rings have diameters from m inches (on the bottom) to m-n inches (on the top); (b) a method that returns the number of rings on the peg; (c) a method that adds a new ring to the top (with the diameter of the ring as a parameter to the method); (d) a method that removes the topmost ring; (e) a method that prints some clever representation of the peg and its rings.