CSE 462: Project 2 (due on April 21, 2015, at 23.55 ET)

This is an individual project: no cooperation is allowed.

Problem 1: E-R (10 points)

You are given the following relational schema (keys underlined):

```
Employee(SSN, Name)

Faculty(SSN)
(Faculty(SSN) references Employee(SSN))

Staff(SSN, ManagerSSN)
(Staff(SSN) references Employee(SSN);
Staff(ManagerSSN) references Staff(SSN))

Student(PersonNo, Name)

Course(CourseNo, Title)

Offering(CourseNo, Semester, InstructorSSN, Credit)
(Offering(CourseNo) references Courses(CourseNo);
Offering(InstructorSSN) references Faculty(SSN))

Enrolls(CourseNo, Semester, PersonNo, Grade)
(Enrolls(CourseNo, Semester) references Offering(CourseNo, Semester);
Enrolls(PersonNo) references Student(PersonNo))
```

Decompile the above schema into an E-R schema representing the same information.

Problem 2: Relational design(10 points)

You are given the following relational schema (keys underlined):

```
Faculty(SSN,Name)

Student(PersonNo, Name)

Course(CourseNo, Title)

Offering(CourseNo, Semester, InstructorSSN, Credit)

Enrolls(CourseNo, Semester, PersonNo, Grade)
```

To do:

1. Represent the above schema as a single relation schema R with a set of functional dependencies F.

2. Is the resulting schema R in BCNF? Prove your answer using the appropriate definitions.

3. If R is not in BCNF, provide its lossless join decomposition into BCNF and determine whether it preserves the dependencies in F.

Problem 3: Extra credit (5 points)

Notation: A, B, C and D are distinct attributes a relation schema $R(ABCD)$. MVDs are defined over R.
Are the following inferences correct? Prove or disprove them using formal definitions.

1. If $A \twoheadrightarrow B$ and $A \twoheadrightarrow C$, then $A \twoheadrightarrow BC$.

2. If $A \twoheadrightarrow BC$, then $A \twoheadrightarrow B$.

3. If $AB \rightarrow C$, then $A \rightarrow C$.