Fall 2022

Comp2411 Tutorial No. 3:
****

1. For the chosen application you had modeled using ER during the tutorial class last time (*in Week 3*), please convert the ER diagram into relational schema (*table structures*) by following the "rules" described in the lecturing class.

2. Consider the following SQL query:

```
SELECT R.a1, R.a2
FROM   R, R1, R2
WHERE  R.a1 = R1.a1
AND    R.a1 = R2.a1;
```

Under what situations does the above query select tuples of the form (`R.a1, R.a2`) when `R.a1` appears in both `R1` and `R2`?

(***Hint***: *Examine carefully the cases where `R1` and/or `R2` may contain empty/null data*.)

3. A database is to be set up to maintain the pool of lecture theatres and to assist in their allocation to courses. Consider the following relation/table with the set of functional dependencies **`F`** defined on its attributes:

```
CourseRmAlloc(CourseId, CourseName, Year, Lecturer, Enrollment, RoomId,
              RoomCapacity, Day, Time)

F = { CourseId -> CourseName,          CourseName -> CourseId,
      CourseId, Year -> Lecturer,      CourseId, Year -> Enrollment,
      RoomId -> RoomCapacity,          RoomId, Year, Day, Time -> CourseId,
      CourseId, Year, Day, Time -> RoomId }
```

   a) Find all the candidate keys of `CourseRmAlloc`. Demonstrate that they are indeed candidate keys.
   b) Determine the highest normal form that the relation `CourseRmAlloc` is in, and justify your answer. What problems will arise with this relation?
   c) Considering the following decomposition, give all the candidate keys for the relations `Course` and `RoomAlloc`. State what normal form each relation is in.

```
Course(CourseId, CourseName, Year, Lecturer, Enrollment)
RoomAlloc(RoomId, RoomCapacity, Day, Time, CourseId)
```