**Chapter 3 homework:**

**Exercise 3.2.1:**

Consider a relation with schema R(A,B,C,D) and FD’s AB🡪C, C🡪D and D🡪A

1. What are all the non-trivial FD’s that follow from the given FD’s? You should restrict yourself to FD’s with single attributes on the right side.
2. What are all the keys of R?
3. What are all the superkeys for R that are not keys?

**Exercise 3.5.2:**

Consider the relation Courses(C, T, H, R, S, G),whose attributes may be thought of informally as course, teacher, hour, room, student and grade. FD’s: C🡪T, HR🡪C, HT🡪R, HS🡪R, CS🡪G. intuitively, the first says that a course has a unique teacher, and the second says that only one course can meet in a given room at a given hour. The third says that a teacher can be only on room at a given hour, and the fourth says the same about students. The last says that students get only one grad in a course.

1. What are all the keys for Courses?
2. Verify that the given FD’s are their own minimal basis.

Use the 3NF synthesis algorithm to find a lossless-join, dependency-preserving decomposition of R into 3NF relations. Are any of the relations not in BCNF?

**Exercise 3.6.3:**

For each of the following relation schemas and dependencies

1. R(A,B,C,D) with MVD’s A🡪🡪B, A🡪🡪C
2. A relation R(A,B,C,D) with MVD AB🡪🡪C, and FD B🡪D

Do the following:

1. Find all the 4NF violations.
2. Decompose the relations into a collection of relation schemas in 4NF.