**Task 1. Will the conversion to BCNF be dependency preserving in any case? Proof your statement and give a reasoning for choosing BCNF design.**

A relation schema R is in BCNF with respect to a set F of functional dependencies if for all functional dependencies in F+ of the for  
 α→β

where α⊆R and β⊆R, at least one of the following holds:

α→β is trivial (i.e., β⊆α)

α is a superkey for R

It is not always possible to achieve both BCNF and dependency preservation.

Consider a schema:

dept\_advisor(s\_ID, i\_ID, department\_name)

With function dependencies:

i\_ID→dept\_name

s\_ID, dept\_name→i\_ID

dept\_advisor is not in BCNF

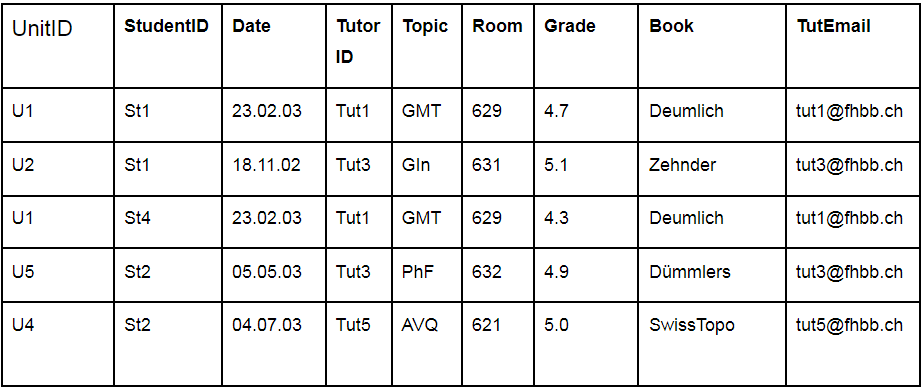
i\_ID is not a superkey.

Any decomposition of dept\_advisor will not include all the attributes in

s\_ID, dept\_name→i\_ID

Thus, the composition is NOT be dependency preserving

**Task 2. Given table in 1NF, convert to 3NF if PK is {UnitID, StudentID}:**

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Transitive dependency:

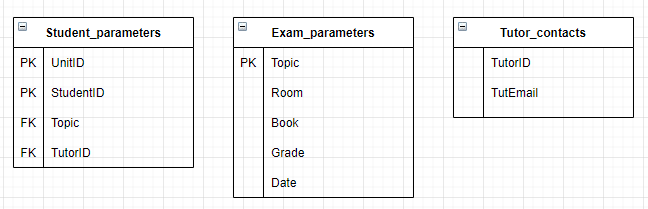
TutorID -> TutEmail;

Topic -> Room;

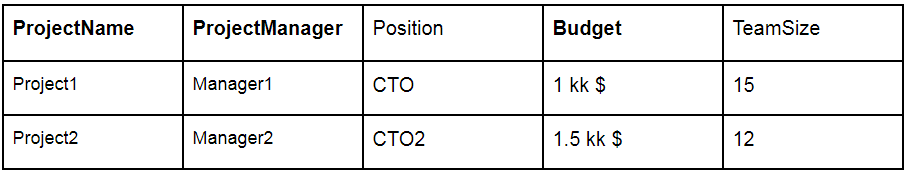
Topic -> Book;

Topic -> Grade;

Topic -> Date;

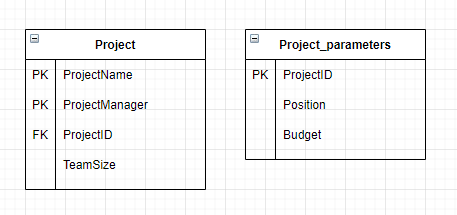


**Task 3. Given table in 1NF, convert to 2NF if PK is {ProjectName, ProjectManager}, use decomposition:**

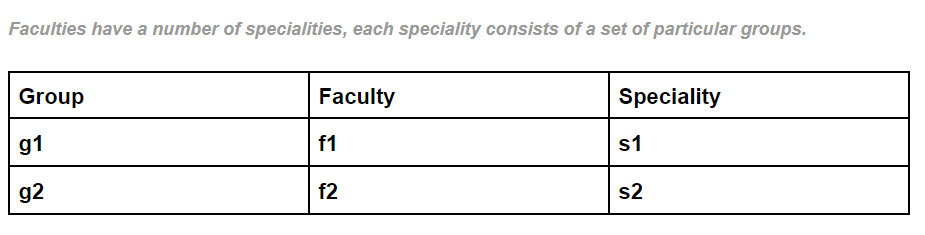


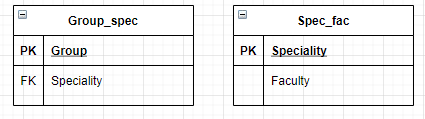
ProjectName -> Position;

ProjectName -> Budget;

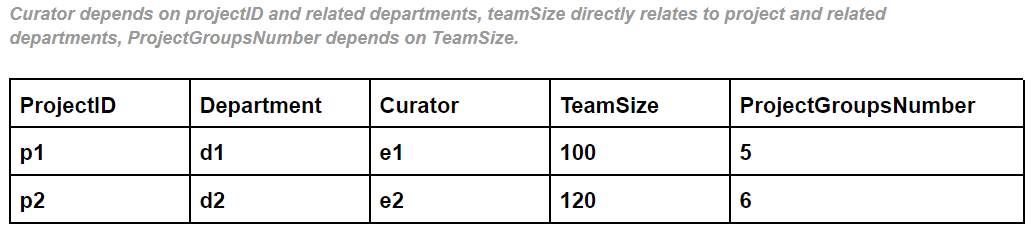


**Task 4. Given table, convert to 3NF if PK is Group, use decomposition:**

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**Task 5. Given table, convert to BCNF if PK is {ProjectID, Department}, use decomposition:**

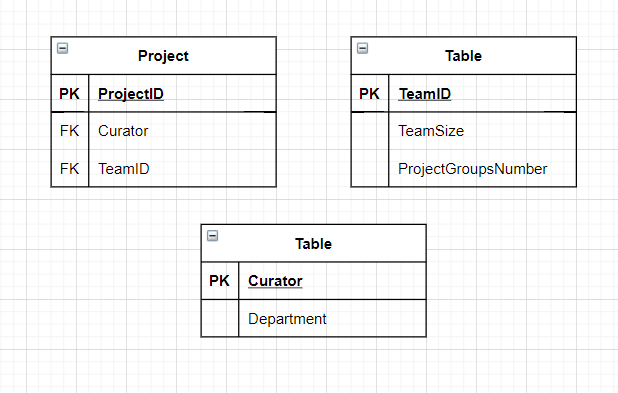
****

ProjectID -> Curator;

Department -> Curator;

ProjectID -> teamSize;

TeamSize -> ProjectGroupsNumber;



**Task 6. List the three design goals for relational databases, and explain why each is**

**desirable. Give an example of both desirable and undesirable types of**

**decompositions.**

For relational databases, atomicity of data is important, uniqueness in attributes in all tables, as well as reducing the number of transitive dependencies, but primary and secondary keys are also needed to preserve logical relationships.