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

UnitID	StudentID	Date	Tutor ID	Topic	Room	Grade	Book	TutEmail
U1	St1	23.02.03	Tut1	GMT	629	4.7	Deumlich	tut1@fhbb.ch
U2	St1	18.11.02	Tut3	Gln	631	5.1	Zehnder	tut3@fhbb.ch
U1	St4	23.02.03	Tut1	GMT	629	4.3	Deumlich	tut1@fhbb.ch
U5	St2	05.05.03	Tut3	PhF	632	4.9	Dümmlers	tut3@fhbb.ch
U4	St2	04.07.03	Tut5	AVQ	621	5.0	SwissTopo	tut5@fhbb.ch

MY SOLUTION:

StudentID	Date	UnitID	Grade
St1	23.02.03	U1	4.7
St1	18.11.02	U2	5.1
St4	23.02.03	U1	4.3
St2	05.05.03	U5	4.9
St2	04.07.03	U4	5.0

unitID	Topic	Book	TutorID	Room
U1	GMT	Deumlich	Tut1	629
U2	Gln	Zehnder	Tut3	631
U1	GMT	Deumlich	Tut1	629
U5	PhF	Dummlers	Tut3	632
U4	AVQ	SwiisTopo	Tut5	621

tutorID	tutEmail
Tut1	Tut1@fhbb.ch
Tut3	Tut3@fhbb.ch
Tut1	Tut1@fhbb.ch
Tut3	Tut3@fhbb.ch
Tut5	Tut5@fhbb.ch
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Task 3. Given table in 1NF, convert to 2NF if PK is {ProjectName, ProjectManager}, use decomposition:

ProjectName	**ProjectManager**	Position	**Budget**	TeamSize
Project1	Manager1	CTO	1 kk $	15
Project2	Manager2	CTO2	1.5 kk $	12

projectName	budget
Project1	1kk $
Project2	1.5 kk $

projectManager	teamSize
Manager1	15
Manager2	12

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

Faculties have a number of specialities, each speciality consists of a set of particular groups.

Group	**Faculty**	**Speciality**
g1	**f1**	**s1**
g2	**f2**	**s2**

Group	Speciality
G1	S1
G2	S2

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

Curator depends on projectID and related departments, teamSize directly relates to project and related departments, ProjectGroupsNumber depends on TeamSize.

ProjectID	**Department**	**Curator**	**TeamSize**	**ProjectGroupsNumber**
p1	**d1**	**e1**	**100**	**5**
p2	**d2**	**e2**	**120**	**6**

Curator	Department
E1	D1
E2	D2

projectID	projectGroupNumber	teamSize	Curator
P1	5	100	E1
P2	6	120	E2

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

We only need to give a counter example: Consider the following schema;

a b c and c->b

Clearly the above schema is in 3NF, because ab->c is a superkey dependency and, from c->b

we can see that b-c=b, which is a subset of the primary key (such dependency is also allowed in 3NF). But, the above schema is not in BCNF because c->b is neither super-key nor trivial dependency.

So we decompose above schema , keeping it lossless.

Only possible lossless decomposition is: ac and cb. (because, their intersection c is primary key for the 2nd table).

But clearly the dependency ab->c is lost.

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.

Lossless Join Decomposition -

- Union of Attributes of R1 and R2 must be equal to attribute of R. Each attribute of R must be either in R1 or R2
- Intersection of Attributes of R1 and R2 must not be NULL.
- Common attribute must be a key for at least one relation (R1 or R2).

Dependency Preserving Decomposition –

- For dependency preserving decomposition, A->B can be ensured in R1(AB) and C->D can be ensured in R2(CD). Hence it is dependency preserving decomposition.
- If a relation R is decomposed into relation R1 and R2, then the dependencies of R either must be a part of R1 or R2 or must be derivable from the combination of functional dependencies of R1 and R2.

Repetition of information –

- condition in database, where the values of one attribute are determined by the values of another attribute in the same relation, and both values are repeated throughout the relation, and both values are repeated throughout the relation.