Kadyrova Anel Lab5

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

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

♣ Consider a schema: dept_advisor(s_ID, i_ID, department_name)

instructor can be associated with only a single department, and a student may have more than one advisor, but no more than one from a given department.

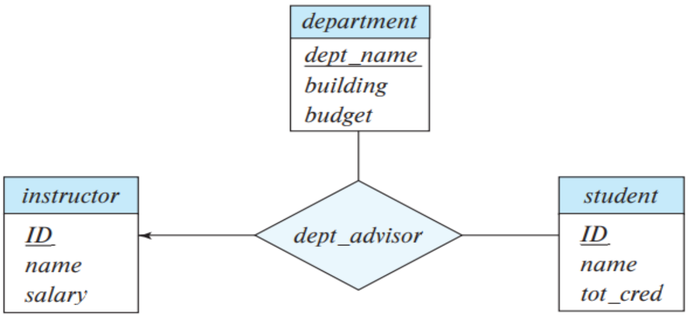

Figure 7.6 The *dept_advisor* relationship set.

The additional constraint that “an instructor can act as advisor for only a single department”.

♣ With function dependencies:

i_ID → dept_name

s_ID, dept_name → i_ID

The first functional dependency follows from our requirement that “an instructor can act as an advisor for only one department.”

The second functional dependency follows from our requirement that “a student may have at most one advisor for a given department.”

♣ 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:

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	GIn	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

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U4	AVQ	SwissTopo	04.07.03	621
U5	PhF	Dümmlers	05.05.03	632

UnitID	**StudentID**	**Tutor ID**	**Grade**
U1	St1	Tut1	4.7
U2	St1	Tut3	5.1
U1	St4	Tut1	4.3
U5	St2	Tut3	4.9
U4	St2	Tut5	5.0

TutorID	TutEmail
Tut1	tut1@fhbb.ch
Tut3	tut3@fhbb.ch
Tut5	tut5@fhbb.ch

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	**ProjectManager**	Position
Project1	Manager1	CTO
Project2	Manager2	CTO2

ProjectName	**Budget**	TeamSize
Project1	1 kk $	15
Project2	1.5 kk $	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

Faculty	Speciality
f1	s1
f2	s2

Speciality	Group
s1	g1
s2	g2

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

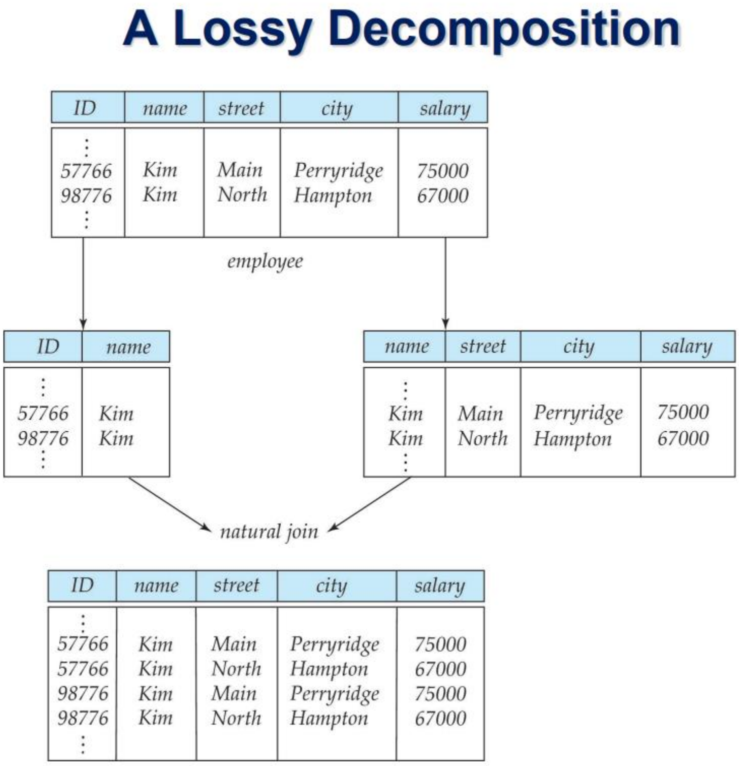
TeamSize	ProjectGroupsNumber
100	5
120	6

ProjectID	Department	Curator	TeamSize
p1	d1	e1	100
p2	d2	e2	120

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.

Goal for a relational database design is:
1. BCNF.
2. Losslessness.
3. Dependency preservation.

undesirable – lossy decomposition
desirable – lossless decompositions
Not all decompositions are good. Suppose we decompose
employee(ID, name, street, city, salary) into
employee1 (ID, name)
employee2 (name, street, city, salary)
The problem arises when we have two employees with the same name
The next slide shows how we lose information -- we cannot reconstruct the original employee relation -- and so, this is a lossy decomposition.



A Lossy Decomposition

ID	name	street	city	salary
⋮				
57766	Kim	Main	Perryridge	75000
98776	Kim	North	Hampton	67000
⋮				

employee

ID	name
⋮	
57766	Kim
98776	Kim
⋮	

name	street	city	salary
⋮			
Kim	Main	Perryridge	75000
Kim	North	Hampton	67000
⋮			

natural join

ID	name	street	city	salary
⋮				
57766	Kim	Main	Perryridge	75000
57766	Kim	North	Hampton	67000
98776	Kim	Main	Perryridge	75000
98776	Kim	North	Hampton	67000
⋮				

Let R be a relation schema and let R1 and R2 form a decomposition of R. That is R = R1 U R2
We say that the decomposition is a lossless decomposition if there is *no loss of information* by replacing R with the two relation schemas R1 U R2
To illustrate this, consider the schema *In_dep (ID, name, salary, dept name, building, budget)* into the instructor and department schemas:
instructor (ID, name, dept name, salary)
department (dept name, building, budget)
Consider the intersection of these two schemas, which is dept name. We see that because dept name→ dept name, building, budget, the lossless-decomposition rule is satisfied