Laboratory work 5

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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)

With function dependencies:

i_ID→dept_name

s_ID, dept_name→i_ID

dept_advisor is not in BCNF i_IDis 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 dependency preserving

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

UnitID	StudentID	Date	TutorID	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

UnitID	Topic	Book
U1	GMT	Deumlich
U2	GIn	Zehnder
U1	GMT	Deumlich
U5	PhF	Dümmlers
U4	AVQ	SwissTopo

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

UnitID	StudentID	Grade
U1	St1	4.7
U2	St1	5.1
U1	St4	4.3
U5	St2	4.9
U4	St2	5.0

UnitID	StudentID	Date	TutorID	Room
U1	St1	23.02.03	Tut1	629
U2	St1	18.11.02	Tut3	631
U1	St4	23.02.03	Tut1	629
U5	St2	05.05.03	Tut3	632
U4	St2	04.07.03	Tut5	621

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	TeamSize
Project1	1 kk $	15
Project2	1.5 kk $	12

ProjectManager	Position
Manager1	CTO
Manager2	CTO2

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	Faculty
g1	f1
g2	f2

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

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

TeamSize	ProjectGroupsNumber
100	5
120	6

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.

1)BCNF:

It is a more restricted form of normalization so that the database does not end in anomalies. The redundancy is comparatively low in BCNF.

2)Lossless join:

The information will not lose from the relation when decomposed. The join would result in the same original relation.

3)Dependency preservation:

It is useful to design the database in a way that constraints can be tested efficiently. If testing a functional dependency can be done by considering just one relation, then the cost of testing this constraint is low. When decomposing a relation it is possible that it is no longer possible to do the testing without having to perform a Cartesian Produced.

Desirable type: Lossless Decomposition

It is feasible to reconstruct relation from decomposed tables using joins.

e_id	e_name	e_age	e_city	dept_id	dept_name
1	Jacob	29	NY	D1	Audit
2	Henry	32	LA	D2	Marketing
3	Tom	22	DLS	D3	Finance

e_id	e_name	e_age	e_city
1	Jacob	29	NY
2	Henry	32	LA
3	Tom	22	DLS

dept_id	e_id	dept_name
D1	1	Audit
D2	2	Marketing
D3	3	Finance

Undesirable type: Lossy Decomposition

When a relation is decomposed into two or more relational schemas, the loss of information is unavoidable when the original relation is retrieved.

e_id	e_name	e_age	e_city	dept_id	dept_name
1	Jacob	29	NY	D1	Audit
2	Henry	32	LA	D2	Marketing
3	Tom	22	DLS	D3	Finance

e_id	e_name	e_age	e_city
1	Jacob	29	NY
2	Henry	32	LA
3	Tom	22	DLS

dept_id	dept_name
D1	Audit
D2	Marketing
D3	Finance